

THE LARYNGOSCOPE.

VOL. LXX

NOVEMBER, 1960

No. 11

REVIEW OF THE AVAILABLE LITERATURE ON THE LARYNX FOR 1959.

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ANATOMY.

Interest manifested in the laryngeal appendix by Broyles¹ was stimulated by the fact that on examining several larynges immediately after laryngectomy, he was impressed with the large size of the laryngeal appendix or sacculle. The sizes of 50 fresh larynges removed at necropsy were carefully studied. Twice as many large sacculles were found in white persons as were found in Negroes. The male sacculle, as would be expected, was larger than the female's. The inside of the sacculle is lined with ciliated columnar epithelium and one of its functions is thought to be provision of adequate mucus over the vocal cords for lubricating purposes.

Pressman and associates² describe interesting experimental work on the larynx by injections of radio-isotopes. They proved that injection of dye or isotopes into one side of the larynx extended only to the median line and did not cross over to the opposite side. The lower border of extension was the inferior border of the cricoid. This finding is significant because it proves that there is no free communication of lymphatics between the larynx and the trachea. Isolation of one

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Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication Oct. 5, 1960.

half of the larynx from the other, corresponds to the known behavior of many cancers of the larynx in which enormous tumors occupy one side of the larynx without involvement of the other. Pressman and co-workers state that sufficient radio-isotopes remain within specific areas of the larynx to be considered of therapeutic value. In reading this article one cannot fail to be impressed with the clinical implications of this study.

Man's desire to simulate a human larynx is responsible for the interesting experimental work by Campbell and Murtagh² in which double reeds were used in conjunction with special tubing. These authors believe that the actual subglottic shape of the thyroarytenoid muscle may be the primary determinant of frequency of vibration of the vocal cords.

PHYSIOLOGY.

Hilding⁴ presents an interesting study on the ciliary beat in the larynx and trachea in which tracheas from freshly killed cows and calves were used. His studies indicate that the plane in which the tracheal cilia beat is generally parallel with the long axis of the trachea. The epithelium on the margin of the cords is squamous, whereas that in the interarytenoid region is ciliated. Practically all mucus normally drained from the lower tract passes out between the arytenoids. There is, however, a slowing down of the flow of the mucus on reaching the level of the vocal cords, particularly at the anterior portion, and occasionally, the blanket of mucus is retarded in the interarytenoid area. Hilding wonders what relation, if any, this pattern of flow has to the distribution of disease in the respiratory tract. Carcinoma occurs most frequently at the margin of the cords and in their anterior half, whereas tuberculous lesions occur characteristically in the interarytenoid area. His theory and speculation are interesting to study.

Thomas⁵ carefully reviews the literature comprising our knowledge of production of esophageal speech. These various studies present a fairly consistent picture of esophageal speech, crediting the cricopharyngeal fold as the pseudoglottis.

Other good studies, however, have demonstrated cases of good esophageal speech despite absence of this structure.

The esophagus forms the main air reservoir, and intrathoracic pressure transmitted into the esophagus provides the force to propel the air through the pseudoglottis and cause speech. The direct inhalation method of obtaining air seems far superior to the swallowing method.

Timcke, von Leden and Moore⁶ conducted experimental studies on vibration of the vocal cords. They concluded that the anatomic configuration of the vocal cords plays a significant role in the production of the vibratory pattern and that changes in air pressure, both static and dynamic, exert considerable influence on the vibratory cycle. Periodic changes of the vibratory pattern occur during voice production, and laughter and other explosive phenomena require more forceful efforts on the part of the larynx.

Sonesson⁷ presents a preliminary report on a method for studying the vibratory movements of the vocal cords which has not been used previously. The subglottic space is illuminated by means of a laryngodiaphanoscope lamp, and the light passing through the glottis is intercepted by a plexiglas rod introduced through the mouth. The rod conducts the light to a multiplier phototube, whereupon the recording takes place by means of an oscilloscope. As a result of vibratory movements of the vocal cords the flow of light through the glottis changes, and a sinusoidal trace is recorded. The apparatus is called glottograph, and the traces obtained are called glottograms. The work of standardizing the method and of collecting and processing more extensive material is in progress.

Furstenberg⁸ presents a highly scientific study giving experimental evidence that laryngeal movements can be obtained by stimulating regions of the cortex other than the primary motor areas. These experiments, conducted on monkeys, are carefully described. The conclusion reached indicates that laryngeal movements can be obtained from many areas of the cortex in addition to the primary motor field. Some of the additional motor areas are in fields where the connections

suggest that they have to do with emotional responses. Furstenberg further states that in the course of normal behavior the additional motor areas of the larynx, like those of other types of movements, serve as centers for automatic associated movements. They dress up and give personality, as it were, to the voluntary motor responses.

Fuller, Fozzard and Wright⁹ conducted radiographic experiments proving the sphincteric action of the cricopharyngeus muscle. This was done by intranasal introduction of calibrated tubes to a point just below the cricopharyngeus and taking repeated roentgenograms.

Laryngectomy, and the consequent respiration by means of the trachea, abolishes the vertical type of physiologic respiratory resistances that frequently exist at the level of the superior air passages. Brunetti¹⁰ presents his observations of the respiratory dynamics in laryngectomized patients. He investigated the pneumotacograms of eight adult patients before and after laryngectomy. After total laryngectomy the physiologic resistances of the upper respiratory tract from the larynx upward were eliminated. Brunetti observed a constant increase in the flow rate during inspiration and expiration, an altered or diminished ratio between expiration and inspiration, and appearance of a post-inspiratory pause. It was also observed that the shape of the pneumotacograms in every patient after laryngectomy had been modified, which indicates less economical function than found in normal persons.

HISTOLOGY.

Grahne¹¹ presents a good review of the literature and description of mast cells, their distribution, chemistry and function. He concluded that a high cell count is a sign of high functional capacity of the connective tissue. In his investigative work, which was conducted on 30 human embryos, the ventricular band, the vocal cords and the laryngeal ventricles were designated for intensive study. Difficulty in staining the cells was encountered but overcome; however, specimens could not be obtained from all regions in the seven smallest embryos. The purpose of this investigation was to study

changes possibly occurring in the mast cell count per unit volume in certain regions of the larynx. Mast cells were found in the larynx of all embryos having a crown-rump length of 5.4 cm. and a 1 per cent increase in the length of the embryo was followed by a 3 per cent increase in mast cell count.

Rüedi¹² presents a complete and enlightening thesis on the histology of the larynx, the types of mucosa and the part they play in the development of malignant disease. He has been able to change the type of mucosa by trauma, drugs and medication.

The second part of the thesis compares the clonic to the tonic theory of voice production. Rüedi adheres to the tonic theory and is convincing in his arguments giving excellent reasons and illustrations.

To be properly appreciated this article should be read and reread rather than summarized.

PHOTOGRAPHY.

Wieland¹³ describes a method of improved photography of the larynx in which he uses an endoscope with a mirror reflex viewing device attached to a Robot camera. More light is transmitted through improved optics. The camera is used much in the same manner as indirect laryngoscopy. Unfortunately, the photographic reproductions were blank, and the type of photography presented could not be evaluated.

DIAGNOSIS.

Laryngography is a useful, simple radiographic diagnostic procedure for evaluating abnormalities of the pharynx and larynx, according to Borden and Berger.¹⁴ After topical application of a local anesthetic, coating of the laryngeal mucosa is obtained by a smooth spread of 5 cc. of a radiopaque medium (Dionosil oily) dripped over the back of the tongue. Four views of the larynx are taken immediately. The results obtained are thought to be diagnostically helpful.

According to Golden,¹⁵ roentgenography of the larynx should

be done by lateral stereoscopic projections and by body section films in the anteroposterior projection. Planigrams should be taken with and without phonation. Roentgenography may give information not obtainable otherwise, as in malignant cases with extension into the pyriform sinus or esophagus or even subglottic extension that would not show up in indirect laryngoscopy.

Because he was dissatisfied with the usual techniques used for direct laryngoscopy Prohovnik¹⁶ resorted to a Haslinger laryngoscope with the patient in the sitting position, employing the posterior approach as used originally in Europe. Prohovnik reports superior results by having the patient sit on a low stool with head extended backwards. The laryngologist stands behind the patient and after adequate cocainization, the laryngoscope is introduced and the larynx clearly visualized.

FOREIGN BODY.

Brandenburg¹⁷ states that foreign bodies can find their way into the air passage of a person of any age. A 30-year-old Mexican, during a drinking spree, apparently had become unconscious and upon regaining consciousness noted that his partial denture was missing and he was unable to talk. On mirror laryngoscopy, firmly impacted in the laryngeal orifice could be seen the missing denture, which was removed without difficulty.

INJURIES.

Penetrating wounds of the larynx are commonly observed during war time, when many persons are exposed to fragments of high velocity missiles. These types of injuries are associated with high mortality and morbidity rates because of alteration of respiratory function and the potential sequelae. During peace time these injuries usually receive more prompt attention, and as a result, the survival rate should be higher and the morbidity rate should be lower than during war time.

This was found to be true by Gregg and Shreves,¹⁸ who describe a penetrating wound of the larynx in which a stone fragment punctured the skin, cricothyroid membrane and lower portion of the thyroid cartilage on the right side, lodging in the airway. Hemoptysis, mild subcutaneous emphysema and hoarseness were the only symptoms. The patient subsequently coughed up the fragment, and a speedy and uneventful recovery followed. Gregg and Shreves discuss the various complications of penetrating wounds and urge prompt action in such injuries.

Holinger and Johnston¹⁹ present a most informative and practical description of laryngeal trauma and its complications. Various causes of laryngeal trauma are discussed, automobile accidents being responsible for the majority of multiple laryngeal injuries. An abnormal or absent voice, or dyspnea, developing after injury is fairly indicative of some type of laryngeal trauma. In all such cases examination, including palpation of the larynx, is indicated. Therapy must be guided by the extent of the injury. Immediate repair within a day or two after the injury is most desirable if fractured cartilage is to be replaced in normal position and the airway reestablished. It is usually necessary to insert a splint in the lumen of the larynx to maintain fractured cartilages in the desired position, and emphasis is placed on low tracheotomy. In multiple injuries in which there is possible fracture of the larynx and the dyspnea is relieved by tracheotomy, too frequently after this procedure the larynx is either forgotten or neglected while attention is directed to other injuries.

Camps²⁰ relates an interesting case in which a man was murdered by a blow on the larynx with the side of the hand producing a vertical fracture of the thyroid cartilage. The body was found hanging from a staircase, and the death was considered suicide. Because of interesting developments the body was exhumed two years later and by conducting experiments it was proved that hanging could not have been the cause of death. A vertical fracture of the larynx can be caused by a blow on the anterior portion of the larynx. The assailant was found, tried and convicted.

DISEASES.

Vocal rest is beneficial in cases of acute and chronic inflammation of the vocal cords, certain cases of specific infections such as tuberculosis, ulcerations, small tumors and postoperative laryngeal conditions. Myerson²¹ is of the opinion that vocal rest for practically all other conditions occurring in the larynx is of little or no good. After deposit of fibroblasts and formation of fibrous tissue, little or no results will be obtained by vocal rest. The presence of fibrous tissue on the vocal cords bespeaks permanency. Myerson discusses contact ulcers and vocal nodules and thinks the latter is best removed by indirect laryngoscopy, although many will disagree with him. He states that application of voice rest has not been too well defined in the past. Comprehension of the tissue changes that occur before and after removal of vocal cord tumors will furnish a better understanding of application of this form of therapy.

Peach and Zaiman²² conducted a study of 122 cases of laryngotracheobronchitis in Toronto, where this condition is a common cause for hospitalization each Winter. The largest number occurred in the age group of 12 to 23 months. One-third of these required tracheotomy. Clinical features are well discussed, and each child was treated in an atmosphere of 100 per cent humidity and given antibiotics freely. That only one death occurred in their series attests to the efficacy of the therapy instituted.

Arthritis of the crico-arytenoid joint is most commonly associated with generalized arthritis. Montgomery²³ reports two such cases in which he was able to obtain postmortem serial sections of the crico-arytenoid joint showing arthritic changes. He also discusses the usual symptoms and states that a positive sign of the disease is pain elicited by pressure against the anterior aspect of the thyroid cartilage or by compression of the superior cornua of the thyroid cartilage. The acute stage of the disease is characterized by considerable hyperemia and swelling of the arytenoids, and manipulation of the arytenoids is painful. In the chronic stage bilateral fixation in the position of adduction occurs, and stridor de-

velops with inspiration, closely resembling bilateral abductor paralysis. Bowing of the vocal cords on inspiration differentiates crico-arytenoid arthritis from bilateral abductor paralysis.

Acute laryngitis may be a serious condition in small children whose larynges are so narrow that moderate edema of the mucosa can close the airway. According to Coffin,²⁴ the outcome of laryngitis in children is often unpredictable as the disease varies in severity from the adult type with mild hoarseness to the swiftly fatal forms, such as laryngotracheobronchitis and epiglottitis. Stridor and dyspnea are warning signs, and the desirability of tracheotomy must be kept in mind. Coffin reports several cases. Corticoids apparently relieved dyspnea and partial respiratory obstruction in all of his patients. In addition to antibiotics, oxygen and mist, prednisone or hydrocortisone parenterally was given to curtail edema and exudation and to open the airway. Improvement was rapid, and the excellent outcome suggests the more frequent use of Cortisone derivatives when acute inflammatory edema threatens a child's larynx.

Copeman, Elkin and Pearce²⁵ report a case of rheumatoid arthritis of the crico-arytenoid joint in a woman 38 years old. Because of bilateral fixation of the cords in the median line tracheotomy became necessary. In spite of all types of therapy the arthritis gradually involved all joints, and eventually the patient succumbed to bronchopneumonia. At post-mortem examination the crico-arytenoid joints appeared to be fixed and immovable. The histologic picture is well described and bears out the general opinion that in arthritis of this joint the arytenoid is fixed, whereas in bilateral abductor paralysis the arytenoids can be retracted or abducted on pressure.

Polisar²⁶ presents an excellent discussion of rheumatoid arthritic involvement of the crico-arytenoid joint. The anatomy and physiology of this diarthrodial joint are thoroughly reviewed. The differential diagnosis of bilateral abductor paralysis and fixation of the crico-arytenoid joint is discussed, and Polisar correctly states that in paralysis the cords are flaccid and easily abducted passively, whereas in

fixation the vocal process and arytenoid eminence are immobile. In reviewing numerous articles on this subject Polisar states that one cannot help but marvel at the clinical acumen of our forebears. This is one of the most interesting articles on this subject that has come to the attention of the reviewers.

Infection with *Candida* (*Monilia*) *albicans* has become a source of greater concern now than in the past. According to Lees,²⁷ lesions due to it have become more in evidence since introduction of antibiotics. Described as the most mutable and treacherous of fungous diseases, moniliasis is widely distributed throughout the world. The broad spectrum antibiotics are known to upset the balance of the bacterial flora in the mouth and gastrointestinal tract. As a result oral, gastrointestinal and vaginal moniliasis are now being seen more frequently.

Cracovaner²⁸ reminds us that hyperkeratosis of the larynx is an important and perplexing subject to the laryngologist. It is a precancerous lesion and must be treated as a potentially malignant growth. An excellent description of these lesions is presented. Cracovaner treats small localized lesions by stripping the cords under direct laryngoscopy. Lesions that recur on one vocal cord are removed by laryngofissure and lesions recurring on both cords are treated by radiation. If this latter is unsuccessful, laryngectomy is performed. Extensive involvement of the larynx by a hyperkeratotic lesion is treated by laryngectomy.

Lupus erythematosus with involvement of the larynx is extremely rare. Scarpelli and associates²⁹ report such a case in a 21-year-old Negro who had been treated for one year. He was apparently progressing satisfactorily, when a sudden explosive onset of laryngeal edema developed and proved fatal. Microscopic evidence in the larynx of fibrinoid degeneration of collagen and of hematoxylin bodies that were Feulgen positive was assumed to be diagnostic of lupus.

Harkins³⁰ advocates use of an improved hydrogen peroxide,

which contains 10 per cent urea peroxide, in the treatment of diseases of the larynx. No specific form of laryngitis that would be benefited by use of this product is mentioned, and it is hard to conceive how it could be used except as a nebulizer.

In a most excellent and instructive paper Davison³¹ describes six conditions responsible for acute laryngeal obstruction in children. These are acute obstructive supraglottic laryngitis, supraglottic allergic edema, laryngeal diphtheria, subglottic allergic edema, acute laryngotracheobronchitis and foreign bodies. Each of these conditions and its specific treatment is thoroughly discussed. Davison stresses the fact that fatalities can be prevented if the correct diagnosis is made early and proper therapy is instituted. In many of these cases tracheotomy must be considered, and it is wise not to procrastinate in the dyspneic patient. Oxygen may be given as a temporary measure, but it is never a substitute for a needed tracheotomy.

According to Blattner,³² various forms of upper respiratory ailments, particularly croup, have been shown to be due to viruses. Recently, a viral strain identified as Type II hemadsorption has been shown to be the etiologic agent in many cases of childhood croup. In addition, this viral strain has been shown to be related to the Asian flu strain. Blattner believes that confirmation of these observations will lead to inclusion of this strain in any vaccine against viruses of the upper respiratory tract.

Bjorkenheim³³ describes two cases of laryngitis of pregnancy. Both patients were completely aphonic. In one, because of toxemia of pregnancy the patient was so dyspneic that she could not be fully recumbent. The second patient had simple laryngitis of pregnancy. In both patients the hoarseness disappeared soon after delivery. Bjorkenheim contends that laryngitis of pregnancy is not basically an inflammatory disease even though an inflammatory type exudate may be present. Careful management of delivery is essential since dyspnea may already be present and closure of the glottis in bearing down may be impossible.

PARALYSIS.

Williams³⁴ investigated 100 thyroidectomies for benign, nonrecurrent goiters. Preoperative indirect laryngoscopy was performed by a laryngologist, and there was no evidence of a nerve lesion. Immediately after the operation the larynx was examined and in none of the 100 patients was there any impairment of motion of the vocal cords. Four or five days later the cords were examined by indirect laryngoscopy and seven of the 100 patients had paralysis of one cord. Five of the seven patients made a complete recovery and two had permanent paralysis. Williams was certain that the nerve had not been divided, crushed or traumatized because of its behavior at the end of the operation. Of the possible causes of early postoperative paralysis Williams believes that edema of the nerve causing compression of its fibers is the most likely. The various aspects of the problem of dissecting out the recurrent nerve so as to visualize this structure properly are discussed. No definite advice to the general surgeon can be offered except that preoperative examination of the larynx in all potential candidates for thyroidectomy should be routine.

Fateen³⁵ conducted experiments on the recurrent laryngeal nerve in dogs in order to establish the extent and permanency of injury from crushing this nerve. Over a long period 80 dogs were anesthetized, and the recurrent laryngeal nerve was exposed and crushed with a Kocher forceps. After recovery the barking was hoarse and remained hoarse for about three months, after which it resumed its normal ringing character in every case. Fateen concluded that nothing should be done until three months after thyroidectomy, since during this time there is hope of spontaneous recovery. Crushing of the phrenic nerve produced no significant change in respiration. Numerous recent articles on this subject are quoted including some advocating attempts at anastomosing the hypoglossal and the distal end of the recurrent nerve.

Finochietto³⁶ makes an ardent plea for better knowledge of the anatomy of the thyroid region and more careful surgical technique in order to avoid trauma to the recurrent laryngeal nerve. Bleeding vessels should be clearly seen before forceps

are applied in order to avoid pinching or crushing the recurrent nerve or one of its branches. Eternal vigilance is a necessity if one is to be successful in avoiding trauma to the inferior laryngeal nerves in thyroid surgery.

Unilateral paralysis of the vocal cord is usually caused by neoplastic disease, including the larynx, pharynx, bronchus, esophagus and thyroid glands as well as metastatic lesions of the mediastinum. When such paralysis is associated with a mass in the neck, tumors of the thyroid are frequent offenders. Seldom, however, does one find an aneurysm of the inferior thyroid artery as the cause of paralysis of one vocal cord. Doumanian and associates²⁷ report such a case, and on clinical examination the cause was undetermined. Operative treatment not only established the diagnosis but also corrected the condition. In a study of 633 cases of such paralysis, Doumanian and associates found that cardiovascular disease was the second most important factor in the etiology of paralysis of the vocal cord; other causes of paralysis in these cases were mitral stenosis, aneurysm of the aorta, cardiomegaly and congenital heart disease.

In a discussion of the significance of paralysis of recurrent laryngeal nerves Vinson²⁸ calls attention to inflammatory conditions affecting the recurrent nerves. Such a paralysis due to inflammation can well be compared to Bell's palsy, which often subsides spontaneously. Vinson reports 14 cases of paralysis of one vocal cord due to inflammatory reactions. In seven patients the voice and normal function of the larynx were completely restored. There is no specific treatment for this kind of paralysis but secondary traumatic laryngitis may be avoided by requesting patients to refrain from forcing their voices.

Mollison²⁹ reports eight cases of idiopathic recurrent laryngeal paralysis seen over a period of years. No attempt is made to give a definite diagnosis as to the cause of the paralysis. The symptoms and clinical observations are described.

STRIDOR.

Congenital laryngeal stridor resulting from hypermobility

of the epiglottis may be corrected by a simple operative procedure as described by Ochs.⁴⁰ With a Davis Crow mouth gag in place, the epiglottis is exposed, and the mucosa on the inferior two-thirds of the lingual surface of the epiglottis is removed in conjunction with a corresponding amount of mucosa from the base of the tongue. These raw surfaces will adhere so that the epiglottis is held in a more erect position, and the stridor is corrected. This surgical procedure was performed on several occasions years ago by one of the reviewers using the suspension laryngoscope to visualize the epiglottis with excellent results.

Smith⁴¹ reports two cases of severe lumbar meningocele, which at one or more times had been seen as emergencies because of laryngeal stridor. One of these patients died of hydrocephalus, the post-mortem examination revealing no abnormality of the larynx. The question of possible "coning" of the medulla with dysfunction of the vagi is raised as a cause for this. Smith warns that tracheotomy should not be employed in such cases, but he does not say what form of treatment should be employed to relieve the obstructed airway in such cases.

Schutt and Robb⁴² report the clinical and necropsy observations on an infant with intermittent stridor which appeared in the third week of life and persisted until death in the sixth week. An anomalous left pulmonary artery, coursing posterior to the trachea, between it and the esophagus, together with the upper left pulmonary vein and aorta crossing anterior to the trachea in normal fashion, formed a vascular ring around the trachea. Progressive obstruction with pulmonary emphysema followed. Only five similar cases have previously been reported, three of which were successfully corrected by operation. The embryologic considerations are also discussed in this interesting report.

Pereira⁴³ presents a good discussion of stridor. The condition is considered under two large divisions, acute and chronic. Eight subheads are discussed under acute stridor and only four are classified as chronic. Laryngeal stridor is seen more frequently in the infant, and when present, it

should never be considered a trivial condition. Occasionally, tracheotomy becomes necessary as a life-saving measure. Stenosis in the region of the larynx or a growth may produce stridor. Immature cartilagenous structures of the larynx, such as the epiglottis and the arytenoids, are frequently responsible for stridor in infants.

STENOSIS.

Laryngologists are familiar with the problem of chronic stenosis of the larynx and upper trachea. Use of acrylic materials in the larynx, as described by Norris,⁴⁴ helps to solve the troublesome problem of inflammatory reaction caused by intralaryngeal rubber molds. Despite frequent changing of rubber molds, ulcerations and granulating tissue were often observed. Acrylic materials do not irritate, and are non-porous, easily shaped and comfortable for months. Norris gives a good description of the acrylic resins, which constitute one class of plastics. The object of core-molding may be to prevent development of chronic stenosis in cases of recent trauma or fractures of the laryngeal cartilages. In addition to this, maintenance of dilatation in chronic stenosis is most important. The various types of molds are illustrated in this article. With the increasing number of laryngeal injuries from automobile accidents, the acrylic mold will play a more important part in rehabilitation of the fractured and stenosed larynx.

Cranmer⁴⁵ summarizes his excellent article on strictures of the larynx by stating that laryngeal injuries are assuming greater importance primarily because of automobile accidents with their high morbidity and mortality rates. That these injuries do not occur more commonly is due mainly to the protected position of the larynx. The many types of open and closed injuries vary widely in severity. Cranmer emphasizes the fact that early treatment should be directed toward maintaining the airway with tracheotomy, prevention of stenosis, internal splinting and careful repair of lacerations. Later cicatricial stenosis may indicate reconstructive surgery and rehabilitation is not complete without speech therapy for persistent hoarseness.

Cicatricial stenosis of the larynx resulting from a feeding tube is rather rare. Schwartz, Devine and Erich⁴⁶ found only five of 142 cases of laryngeal stenosis seen from 1940 through 1958 to be due to feeding tubes. Management of laryngeal stenosis depends on the degree of respiratory and vocal impairment and the general condition and age of the patient. Minor degrees of stenosis may be overcome by dilation. Severe degrees of stenosis or completely stenosed larynges can be successfully corrected only by surgical reconstruction consisting of excision of scar tissue, lining the larynx with a free split-thickness skin graft, and wearing an obturator to prevent contraction and subsequent closure of the stoma. Such treatment is long and drawn out, requiring much patience on the part of the laryngologist as well as the patient.

Rapid progress has been made in the surgical treatment of chronic laryngeal stenosis since Schmiegelow described his method in 1929. His operation with modifications has given excellent results. Smathers⁴⁷ believes that many patients continue to wear a tracheotomy tube because of cicatricial stenosis of the larynx. This can be corrected by proper treatment, which consists of removal or control of the infectious process before reconstruction is attempted. Smathers emphasizes the necessity of low tracheotomy and states that reconstruction of the laryngeal lumen is a three-stage procedure requiring six to 12 months for completion. Through a laryngostomy approach the stenotic area is removed and a skin graft inserted over foam rubber. Ten days later the rubber stent is removed, and an acrylic obturator molded to the interior of the larynx is inserted into the larynx and allowed to remain there from six to nine months, after which the laryngeal stoma is closed and decannulated if the procedure has been successful.

Holinger and Johnston⁴⁸ present an excellent study of 163 cases of chronic laryngeal stenosis treated during the past ten years. It now seems that trauma is rapidly replacing acute laryngeal disease as the commonest cause of chronic laryngeal stenosis. Management of these various problems is discussed. Emphasis is placed on the importance of performing reconstructive procedures within the first few days of the

accident, before the cartilages have become fixed in their new positions and before development of scar tissue. The most effective treatment of chronic laryngeal stenosis is preventive: tracheotomy rather than intubation, low rather than high tracheotomy, removal of feeding tubes if possible, and therapy of acute laryngeal abscesses, tuberculosis and crushing injuries of the larynx. This article should be read by all who practice laryngology.

ANESTHESIA.

Steiner⁴⁹ describes a new type of laryngeal spray utilizing the sprinkler system with ten small holes in the distal end of the cannula. The patient is first made to gargle with an analgesic solution and then a laryngoscope is used to visualize the larynx. The new laryngeal syringe, consisting of a cannula 20 cm. long with a slight-anterior curve at the distal end, is introduced into the larynx. This laryngeal spray is intended to produce thorough anesthesia of the larynx, thereby facilitating introduction of intubation tubes for anesthesia.

Proctor and Edgerton⁵⁰ describe management of a case of traumatic occlusion of the larynx secondary to endotracheal anesthesia. Endotracheal anesthetization performed on two occasions three years apart was followed by progressive, increasing hoarseness and dyspnea. Mirror examination showed the larynx to be filled with a granulomatous mass. After tracheotomy a large skin flap was turned back across the midline of the neck, and the laryngeal cartilages were explored. The thyroid cartilage was split in the median line, and the granulomatous tissue was removed from the interior of the larynx. A split thickness graft was fitted about a stint of polyvinyl alcohol sponge shaped to fit the glottic aperture. This was held in the denuded portion of the larynx by a No. 28 stainless steel wire suture passed through the thyroid cartilage and skin. The thyroid cartilage was closed by appropriate sutures, and excellent final results were obtained. Good illustrations accompany this excellent paper.

Gabuya and Orkin⁵¹ describe a new laryngoscope with a curved blade to facilitate introduction of an intubation tube

for induction of endotracheal anesthesia. Advantages are that the new laryngoscope may be introduced more easily into small mouths, preferably on the right side, better visualization of the larynx, better protection of the upper teeth, and improved use of binocular vision. General views of this new laryngoscope are shown.

Campkin⁵² states that contact ulceration and pedunculated laryngeal lesions may occur in the pathogenesis of post-intubational granuloma, an uncommon complication of endotracheal intubation. He believes that the incidence of this form of granuloma is increasing because of the frequent use of endotracheal intubation in recent years. Post-intubational granuloma is more common after thyroidectomy probably because of hyperextension of the head and the placing of a sand bag or pillow under the shoulders. In this position the endotracheal tube will make pressure on the vocal process.

Schwarzbart⁵³ reports eight cases of intubation granuloma. He believes that the incidence of this condition can be decreased by careful preoperative screening of surgical patients for catarrhal, allergic and inflammatory conditions with postponement of operation when possible if any of these conditions exist. Postoperative physical rest and silence are recommended together with systematic laryngoscopic examination to prevent progression or development of these lesions.

SURGERY.

Lillie and Devine⁵⁴ describe the indications and their technique for the laryngofissure operation, which does not differ from the generally accepted procedure. In brief, it consists of suspension laryngoscopy and biopsy. An intratracheal tube is inserted through the mouth, and the suspension laryngoscope is removed. The neck is prepared and draped, and tracheotomy is performed. The intratracheal tube is removed, and a cuffed tube is introduced through the tracheal stoma. It is a bit confusing to note, in another paragraph, a statement that Lillie and Devine always perform the tracheotomy with use of a local anesthetic. The usual midline incision is described, and the thyroid cartilage is split with an oscillating

saw. Retraction of the wings of the thyroid laterally brings into view the lesion on the vocal cord. Dissection is carried out, and the mass is removed *en bloc*. Bleeding is controlled by ligation and electrocoagulation. The tracheotomy tube is removed on the fourth or fifth day. The incidence of cures obtained by others ranges from 75 per cent to 92 per cent, but the results obtained by Lillie and Devine are not given.

Schall⁵⁵ describes an extralaryngeal approach for certain benign lesions of the larynx by means of an incision at the upper margin of the thyroid alae on the involved side. By dissection the tumor is exposed and usually extirpated without entering the interior of the larynx. This simple, practical operation is briefly described and well illustrated. It is best adapted for slowly growing, submucosal, supraglottic and intraglottic new growths and cysts of the larynx.

In an excellent comprehensive article Reed, Mueller and Snow⁵⁶ present a detailed report of 200 cases of radical neck dissection between 1948 and 1958. Their method of study and analysis of the primary site and grade of the lesions and the classification of the nodes found in the neck leave little to be desired. For those interested in the study of neck dissections this article is highly recommended.

Conley⁵⁷ presents methods of primary closure of the larger laryngeal wounds created in performing partial laryngectomies, with illustrations. His description of the technique of flap movement of mucous membrane is such that to the uninitiated it sounds easy. Conley claims the resultant voice and airway show much improvement after use of a mucous-membrane flap in the rehabilitation of the partial laryngectomy wound.

LARYNGOCELE.

DeRosario and co-workers⁵⁸ state that laryngocele, a rare and interesting swelling of the neck, arises from the ventricle of Morgagni, where an outpouching frequently occurs in the roof of the ventricle. It is usually caused by repeated elevation of intralaryngeal pressure, which is transmitted to the sacculus, and which may dilate to form a laryngocele. As the

sacculus dilates, it is usually contained by the thyrohyoid membrane; however, if it penetrates this membrane, it then becomes known as an external laryngocele and is located in the anterior triangle of the neck. Such a case is reported.

BENIGN TUMORS.

Scleroma is an endemic disease prevalent in Eastern Europe, Russia, South America and certain far eastern islands. It is a specific granuloma affecting mainly the nose, although the pharynx, larynx, trachea and bronchi may be affected. Mas-soud and Awwad⁵⁹ present a clinical review of 84 cases of scleroma treated between 1951 and 1956. Eighteen patients had laryngeal involvement, in all of whom the subglottic region was affected. When granulomatous infiltration involved the interior of the larynx, deformity of the structures resulted, and concentric narrowing of the subglottic airway and upper part of the trachea occurred. Known antibiotics have no effect on scleroma. Roentgenotherapy is of some benefit.

In an editorial⁶⁰ it is stated that benign tumors of the vocal cords frequently present confusing diagnostic problems; in fact, the clinical picture cannot always be reconciled diagnostically with the pathologist's interpretation of the extirpated tissue. This is particularly true for polypoid laryngitis since there is no acceptable histopathologic picture characteristic of laryngeal polyps. It is thought that these polyps originate in the subepithelial space of Reinke and are able to assume various histologic appearances. There is general concurrence that trauma of vocal abuse and the irritation from smoking are the common inciting factors producing polypoid laryngitis. Accurate surgical removal of the polypoid tissue followed by pathologic examination for confirmation of the clinical diagnosis is always desirable.

Chondromas are among the rare connective tissue tumors of the larynx, 80 per cent of which are found in men. Schiff and Bender⁶¹ report such a case occurring in a housewife who had a tumor removed from the larynx 28 years before. They were unable to obtain the original histologic diagnosis. A laryngofissure approach was used to remove the chondroma

from the right side of the larynx after which the patient made an uneventful recovery.

Walter⁶² reports a case of chondroma of the larynx. In his review of the literature he found 96 cases. An outstanding characteristic of this tumor is failure to metastasize, but frequent local recurrence results from inadequate removal.

Arnvig⁶³ reports apparent regression of advanced papilloma of the larynx after use of hydrocortisate spray three times daily in a seven-year-old girl. During nine months, the tumor had not recurred. Simultaneously, with this treatment, however, she had had repeated simple excision of the papilloma, application of podophylline solution, roentgenotherapy and tracheotomy, so that recovery cannot definitely be attributed to the hydrocortisate spray. If this simple method of treatment proves to be effective in other cases, it will be a most valuable addition to the therapeutic armamentarium of the laryngologist.

Moffitt⁶⁴ successfully used wart vaccine of bovine origin in the treatment of multiple papillomatosis of the larynx. Dramatic cessation of regrowth occurred in one case and decided improvement was noted in three others. Since papilloma of the larynx has resisted all forms of treatment, it seems worth-while to use this vaccine in additional cases to determine further its value.

Nunez⁶⁵ presents a review of a large number of articles written on the treatment of multiple papillomatosis of the larynx. He quotes these various authors and comments on the therapy employed by each. He is forced to the conclusion that there is no one treatment for laryngeal papillomatosis and that many of these cases clear up at the age of puberty. He advocates pinching of the papilloma under direct laryngoscopy with as little damage to the normal mucosa and to the vocal cords as possible.

Baker⁶⁶ informs us that pseudosarcoma is the term introduced by Lane to indicate large polypoid connective tissue masses associated with squamous carcinoma of the mouth, fauces and larynx. Occasionally, these masses assume such

prominence as to dominate the clinical picture completely. The lesion has the gross appearance of a sarcoma, and when examined with the microscope, resembles a highly anaplastic growth with giant neoplastic cells. The pathology is thoroughly discussed. Baker reports three cases of pseudosarcoma of the larynx, which is a nonmalignant connective tissue tumor, usually associated with squamous cell carcinoma.

Harper⁶⁷ states that fatty tumors of the pharynx and larynx are uncommon and are probably one of the rarest forms of benign tumors encountered in this region. He found 30 such cases in the literature and added one of his own. This was a lipoma attached to the posterior portion of the larynx; it was smooth and pale yellow. It had caused choking, coughing and laryngeal spasm. Its surgical removal presented no difficulty.

Nimbkar, Gadre and Desa⁶⁸ report a case of neurofibroma of the larynx and review the literature on this subject. In this location neurofibroma is considered rare. These tumors have no tendency to invasion but tend to destroy the structures in the vicinity by direct pressure. The chief symptoms are hoarseness and eventually dyspnea. Treatment is surgical excision either intralaryngeally or by an external approach, and as a rule, the diagnosis is made postoperatively by the pathologist.

Barley⁶⁹ states that during the last two years a series of plasma cell granulomas have been detected in a small farming area around Plymouth, England. The lesion consists of ulceration or proliferation of tissue within the mouth, pharynx and larynx and resembles no other condition. It is extremely painful and is resistant to any form of local treatment except Cortisone derivatives. The one case involving the larynx required not only tracheotomy, but also a transhyoid approach to remove the granulomatous lesions, which have not recurred.

Laryngeal cysts may be congenital, retention, degenerative, lymph, blood or implantation cysts. Retention cysts are by far the most common type of cyst found in the larynx and most frequently occur in the glosso-epiglottic recess. El Mofty⁷⁰ reports a large, trilobed, laryngeal cyst obliterating

view of the glottis and occupying the right aryepiglottic fold, the ventricular fold and the pyriform fossa. The cyst was successfully removed through an incision along the border of the sternocleidomastoid muscle.

Amyloidosis is the deposition into tissues of a substance called amyloid because of its resemblance to starch. Many theories have been developed in an attempt to determine the etiology of amyloidosis. Although the condition is rare, Holinger, Johnston and Delgado⁷¹ report seven cases seen by them. The clinical picture and pathology are well described. The diagnosis is always made by microscopic examination of the tissue. The treatment advocated is surgical removal endoscopically, which was successful in all but one of their cases.

Smith⁷² reports a case of a true benign striated muscle tumor of the larynx. Only two other cases have been recorded since Ewing's classical description in 1919. According to Smith, this condition is distinct from the granular cell myoblastoma of the larynx, and the granular cell probably represents a degenerative lesion of muscle rather than an embryonic precursor of striated muscle fibers.

MALIGNANT TUMORS.

Virtama and Harma⁷³ reviewed 724 cases of laryngeal carcinoma from the standpoint of influence of institution of adequate treatment. They believe that delay in institution of adequate treatment is the most significant factor in the mortality rate of laryngeal carcinoma. Among the 724 patients, delay in consulting a physician was responsible for 50 per cent of the total sample and the next most significant factor was failure of the general practitioner to recognize symptoms.

Postoperative management of carcinoma of the larynx entails not only the immediate period while the patient is in the hospital, but also the five-year period after operation during which the patient should be observed and treated for associated conditions, according to Callahan,⁷⁴ who reports the case of a patient emotionally disturbed after operation on the larynx. These emotional disturbances must be recognized and managed with the greatest of care.

Fisher and Miller⁷⁵ reviewed 48 cases of carcinoma *in situ*. They point out that this type of lesion continues to present a problem to the laryngologist. It is still not possible to describe a characteristic clinical picture obtained by direct or indirect laryngoscopy that would lead to a diagnosis of carcinoma *in situ*; however, this lesion can be recognized in three distinct histopathologic types: the basal, the squamous and the bowenoid. Leukoplakia was the most frequent pathologic change observed on the cords. The therapy of this condition is fully discussed.

Asbury⁷⁶ reports an unusual case of sarcoma of the larynx in a woman 36 years old. Nine years previously she had had a tumor in the right knee which eventually was diagnosed as chondrosarcoma. The same diagnosis was established in the larynx, and this was thought to be metastatic; however, because this was the only manifestation, the question arose as to the possibility of this lesion's being primary. Sarcomas constitute only 1 per cent of malignant lesions of the larynx.

Pietrantonio, Felisati and Finzi⁷⁷ studied the frequency of laryngoceles and carcinoma of the larynx and the relationship of these two types of lesions. The records of more than 1,000 patients who had laryngectomies were examined; in 857, complete records with tomographs were available for study. The incidence of laryngocele and carcinoma of the larynx occurring simultaneously was 6.18 per cent. It was concluded that there is no definite relationship between these two types of lesions and that other factors are responsible for the production of laryngoceles.

Clarke⁷⁸ reports successful use, for a long period, of a prosthesis to close a large esophageal fistula in a man, 71 years old, with extensive intrinsic carcinoma of the larynx. He was given a heavy course of irradiation before total laryngectomy. Postoperatively, a large pharyngo-esophageal fistula developed, which persisted in spite of repeated plastic operations. After six months of tube feeding, the portex tube, as described by Shaw and Ormerod in 1957, was inserted into the pharynx and allowed to remain there for seven months. During this time food could be taken orally, and secretions

would not spill out into the tracheal stoma. Tissue reaction necessitated changing of the tube every three months after this. The shape of the tube, a cylinder with its upper end flared and a fusiform dilatation just below the flare, renders it self-retaining, and apparently, it is well tolerated by the patient. This seems to be a simple, practical method of temporarily solving a debilitating complication of laryngeal surgery.

Foroughi and Rosedale⁷⁹ report the case of a 64-year-old woman with intrinsic carcinoma of the larynx removed by laryngofissure. The patient was asymptomatic for 11 years before recurrence necessitated laryngectomy. A concise review of the age and sex incidence of this disease as well as its usual histologic types and location are included.

Sarma⁸⁰ makes the astounding statement that cancer of the larynx forms approximately 33 per cent of all tumors of the body seen in Assam. He also states that cancer of the larynx forms 50 per cent of cancers of the upper alimentary tract. No reason is offered to explain this tremendous incidence of this particular lesion. Sarma frankly states that the population is ignorant of the symptoms of cancer of the larynx and implies that the doctors in Assam are not much better informed; hence, there is much delay in establishing a diagnosis. It is unfortunate that so little of ear, nose and throat diseases is taught undergraduates in Assam.

Storer and Goodsitt⁸¹ remind us that carcinoma of the larynx is primarily a disease of males. They report a case of a highly malignant oat-like-cell carcinoma occurring in the larynx of a woman aged 25 years. The patient received Roentgen radiation to the neck for tuberculous adenitis. Storer and Goodsitt question whether this therapy may have played an important part in the development of carcinoma of the larynx in such a young woman.

Nelson⁸² reviews, discusses and reports the newer methods of treatment of cancer of the laryngopharynx. A number of cases are reported; each one had such extensive lesions that only major surgical procedures developed in the last few

years could offer these patients any hope. Laryngectomy, single or bilateral block dissection of the neck and pharyngotomy and pharyngectomy offer these patients an excellent chance of cure.

Feinmesser and Gay⁸³ report an unusual case of carcinoma of the larynx. In January, 1952, a biopsy specimen from the right vocal cord was reported as anaplastic carcinoma. The patient refused operative or radiologic treatment. Two years later a painless swelling about the size of an egg developed on the right side of the neck. Indirect and direct laryngoscopy failed to show evidence of a lesion in the larynx. The tumor was removed surgically; the pathologic report was anaplastic carcinoma involving a lymph gland. Undoubtedly, this was metastatic carcinoma of the vocal cord, which now showed no evidence of malignant growth. Apparently, the cordal carcinoma was removed completely at the time of the biopsy. Radical block dissection of the neck was done, and five years later the patient showed no sign of recurrence. It is now seven years since the original biopsy.

Surgical treatment of cancer of the post-cricoid region which involves the entire circumference of the mouth of the esophagus is difficult for the patient as well as for the surgeon. Since 1926 Sercer⁸⁴ tried various methods of management of such lesions without success. If the tumor has not invaded the larynx, Sercer advocates lateral hypopharyngoscopy with complete removal of the malignant lesion followed by severing of the trachea and creation of a permanent tracheal stoma. The larynx is then slightly displaced backward, and the lower portion of the larynx and trachea are sutured to the upper portion of the esophagus and the upper portion of the larynx to the hypopharynx. Interference with the blood and nerve supply is assiduously avoided, and a feeding tube is passed between the vocal cords into the esophagus and stomach. Rapid convalescence occurred in the three cases reported. These patients speak with the larynx and swallow through the same organ. Little comment is made on the quality of the voice.

O'Keefe⁸⁵ reminds us that early in the care of the patient

with laryngeal cancer, we are confronted with the decision to operate and must select a technique appropriate to the task. Such a selection is based on inclusive appraisal of the patient, including his tumor, and it should have as its primary intention, the best chance of cure. O'Keefe discusses the various types of laryngeal cancer and their criteria of operability. The intent of this presentation is to help clarify the issue of conservative vs. radical in the surgical treatment of laryngeal cancer.

In an interesting and comprehensive paper Norris⁶⁶ discusses the causes of failure in surgical treatment of malignant tumors of the larynx. This study covers 209 cases of partial laryngectomy, 181 cases of laryngectomy and 64 cases of laryngectomy with simultaneous block dissection. Each of these groups is considered separately, and appropriate comments are offered. The changing surgical trends for carcinoma of the larynx is discussed, and the fronto-lateral operation is advocated in the endolaryngeal cases with involvement of the anterior commissure. The indications for radical neck surgery in conjunction with laryngectomy are increasing and statistics show less recurrence when this form of surgical treatment is followed. This is a most interesting presentation which should be read in its entirety to be appreciated.

McGavran, Spjut, and Ogura⁶⁷ present a critical analysis of the success and failure of laryngofissure in the treatment of laryngeal carcinoma. Laryngofissure as the only definitive therapeutic procedure was considered a success if the patient was alive five years or more without evidence of persistent carcinoma or if the patient died within five years but had no evidence of carcinoma at necropsy. The operation was considered a failure if subsequent irradiation or surgical therapy was employed, carcinoma recurred, or the patient could not be traced or died without necropsy. Much depends upon proper evaluation of the existing lesion. Seventy-four per cent of well differentiated cancers were treated successfully whereas only 35 per cent of the poorly differentiated cancers were controlled by laryngofissure. The presence of tumor at the excisional margins and invasion of intrinsic muscles contribute

to failures. Much emphasis is placed on periodic observation for indefinite periods.

It is surprising to read that the authors conclude that "Because the survival rates of patients with intrinsic laryngeal carcinomas treated by irradiation are reported as good as, if not better, than those treated by laryngofissure, and because the functional result in terms of voice is better after irradiation therapy, it would seem that irradiation should supplant laryngofissure as the therapy of choice."

Riegler⁸⁸ analyzes statistics in the treatment of laryngeal carcinoma at the Roswell Park Memorial Institute, Buffalo, New York, from 1935 to 1955. Before 1951 most laryngeal malignant tumors were treated by radiation, and after 1951 surgical removal was more extensively employed. The results for cordal, intrinsic and extrinsic laryngeal malignant tumors were strikingly better with surgical treatment than with radiation.

Work⁸⁹ reports his surgical experience with 22 patients treated initially with Roentgen rays for primary carcinoma of the larynx. All had received adequate roentgenotherapy and surgical intervention was necessary because the carcinoma had not been arrested. Work describes the groups into which these cases were placed when seen and the type of surgery performed in each group. All needed wide field laryngectomies, and in addition several needed radical neck surgery. The time interval ranged from two months after irradiation to 12 years. No surgical technical difficulties were encountered when operated upon within a year after radiation; however, surgery of the neck, on patients who have had irradiation 12 months or more for cancer of the larynx, is fraught with many difficulties. This is an excellent article worth reading in its entirety.

In an interesting article appearing in the *Cancer Bulletin*⁹⁰ cancer of the larynx is discussed at length. It is stated that the optimal chance for preservation of life and the voice of the patient with laryngeal cancer is afforded if the surgeon and the radiotherapist work together as a team to determine the

treatment of choice. When successful, radiotherapy offers the advantage of preservation of the voice whereas surgical intervention offers a higher percentage of cures. The complexity of the laryngeal structures and the nature of the different types of cancer in these structures make necessary separate analysis of the therapeutic problem in each case.

In a discussion of cancer of the larynx, Mill⁹¹ divides the larynx into supra-glottic, glottic and sub-glottic regions. He emphasizes the significance of persistent hoarseness and the value of early examination. Teleradium bomb and the cobalt beam are discussed as one form of treatment and laryngofissure and laryngectomy as the other form. The necessity on occasions of radical neck dissection is mentioned. Mill does sound a good warning which should receive attention: if after tracheotomy laryngectomy is performed, recurrence of the growth near the tracheal stoma is not at all rare; this implies the possible transmission of cancer cells by tracheal secretion to a new raw area. This is food for thought.

The purpose of a paper presented by Wood⁹² is to describe the techniques and the early results of treatment of carcinoma of the larynx by supervoltage radiation. The average laryngologist will be interested in knowing that it is claimed that supervoltage radiation causes less cutaneous reaction. Seventy-two patients with carcinoma of the larynx were treated. Thirty of these were considered to have stage I with full mobility of the cords, no nodes and disease limited to the mucous membrane; 87 per cent survived one year and 73 per cent two years. There were 39 cases in stages II and III and the one- and two-year survival rates were 77.5 per cent and 64.5 per cent, respectively. The reviewers are of the opinion that the results obtained in stage I were such that no other patient should have been subjected to such treatment when the survival rate the second year was 73 per cent. Other methods offer patients with stage I disease a much greater survival rate.

Nachlas⁹³ describes cobalt 60 teletherapy as essentially a form of super voltage roentgen-ray therapy which is, for all practical purposes, identical to two to three million volt

roentgen-ray generators. When first results of cobalt 60 were published, the general trend of opinion was highly favorable; however, recent reports, according to Nachlas, indicate cobalt 60 therapy is not proving as efficient in the number of five-year cures as was first hoped. Nachlas sounds a warning to surgeons. With conventional Roentgen-ray the skin assumes a typical burned appearance, but with cobalt 60 the skin appears normal in spite of skin devitalization and will lead the surgeon into serious complications he might have avoided. Judging from the findings in the series of cases herein presented and a review of the literature, Nachlas concludes that surgical removal is still the treatment of choice for carcinoma of the laryngopharynx.

Padovan⁹⁴ describes use of artificial radioactive elements in 195 cases of malignant tumors of the larynx. Radioactive cobalt pellets, strontium tablets or cesium sticks were introduced into the lumen of the larynx by means of laryngofissure or endolaryngeal catheter, to deliver doses of irradiation to the tumor as high as 15,000 *r*, several times higher than could be accomplished by external irradiation. This method is reported to produce less apparent effect upon the cartilage of the larynx and skin of the neck and to be simpler, shorter, more easily tolerated and much cheaper than conventional methods of irradiation. Although the question of whether the same results might be achieved by giving postoperative irradiation, or no irradiation at all, is not actually answered, use of isotopes will almost certainly attract the further interest and attention of laryngologists.

Dillion⁹⁵ points out the importance of close cooperation between the surgeon and radiation therapist in the effective treatment of laryngeal tumors. In a discussion of carcinoma of the larynx he seems to favor radiation therapy for many types of lesions. His discussion of the surgical indications leaves much to be desired. Corpectomy, partial laryngectomy for anterior lesions and total laryngectomy are discussed, but laryngofissure and thyrotomy are not mentioned. The three major techniques employed in radiation therapy of the larynx are described in detail. The poor description of surgical techniques leads one to believe that the author is a radiologist.

In a review of the results of treatment in six major treatment centers, as well as 58 cases of his own, Cantril⁹⁶ reports that there have been improvements in the techniques of radiation therapy in the past two decades. Chief among these are careful clinical observation during the course of treatment to determine the amount of fractionation of the planned dose, and strict limitation of the size of the field commensurate with the extent of the disease. He believed that more collaborative selection of patients for limited surgical treatment, laryngectomy or irradiation would result in higher rates of cure with preservation of the larynx. He concludes that treatment is least successful in advanced endolaryngeal cancer with cartilaginous invasion, immobility and edema of mucosa. These cases, as well as lesions at the anterior commissure involving thyroid cartilage, and all frank subglottic cancers, he believes, are best treated by laryngectomy. He advocates roentgenotherapy for cancer involving the epiglottis.

A prediction by the pioneer radiotherapist, Henri Coutard, that between one-third and one-fourth of cancers of the larynx can be made to disappear through irradiation seems to be substantiated by the survival of approximately one-third of the total number of patients treated in whom subsequent laryngectomy was not necessary. Another one-sixth of the total number survived with subsequent laryngectomy. This paper requires careful reading to avoid misinterpretation of wording at times but is of interest to all who treat laryngeal carcinomas.

Perrone⁹⁷ describes his method of combatting the annoying and serious problem encountered in the development of tenaceous secretion with actual crust formation in the tracheobronchial tree after laryngectomy. The apprehension of the patient during the episode of dyspnea, due to obstruction in the tracheobronchial tree by the secretion and crusts, leads to consternation with mental depression, and often despondency. In the series surveyed by Perrone crusts and scabs developed in the trachea of only 2.75 per cent. Particularly was this true during the winter months. In such cases Alevaire with a nebulizer softened and dissolved these crusts by spraying this solution into the tracheobronchial tree.

Norris⁹⁸ states that deformities resulting from total laryngectomy and from operations which include laryngectomy depend in large part on the extent of the surgical removal. Persistent pharyngeal fistula, stenosis of tracheal stoma and stenosis of upper trachea and keloids are the most common deformities encountered. These and many other conditions occurring postoperatively are well discussed.

Szunyogh⁹⁹ describes the shoulder disability after radical neck dissection in which the spinal accessory nerve is necessarily severed. This results in palsy of the upper half of the trapezius muscle with consequent "shoulder drop," and eventual painful periarthrititis of the shoulder joint. This discouraging sequence of events can be relieved only temporarily by use of sedatives, analgesics, local heat, and elevation in a sling. Shoulder exercises seem to be useful in slowing down the onset of periarthrititis, but this effect is always temporary. In spite of this disability, Szunyogh does not advocate preservation of the nerve for successful surgical treatment of cancer.

Nursing care of the laryngectomized patient presents specific mechanical and psychologic problems.¹⁰⁰ Apprehension about loss of the voice is undoubtedly intensified by the necessity for innovations that are strange and, therefore, alarming to the patient, such as the laryngectomy tube, nasogastric feedings and the actual realization of inability to talk. Preoperative instructions are most important to the family and patient, and this article in the *Cancer Bulletin*¹⁰⁰ states that although the necessary procedures for postlaryngectomy care of the patient are simple, they must be performed with care and skill. Frequent cleansing of the laryngectomy tube and suction of thick mucus from the tracheobronchial tube are important for the comfort of the patient. If cyanosis develops, immediate removal and changing of the laryngectomy tube is advisable, as crust and thick gelatinous mucoid material will frequently block the distal end of the tube. The inner cannula should be cleansed frequently during the first few days. Teaching the patient to care for his own needs restores his self-reliance, and when sufficient time has elapsed and normal feeding is resumed, the patient should be prepared psychologically for rehabilitation speech therapy.

MacGregor¹⁰¹ devised a new appliance whereby laryngectomized patients in whom esophageal voices fail to develop may be helped to produce a voice by artificial means. It consists of an electrically vibrated diaphragm built into an upper dental prosthesis thereby carrying the source of the sound directly into the mouth. The advantage of the oral vibrator is that all sound is generated where it can be used for voice production, resulting in highly intelligible speech. The device is relatively inconspicuous. Unfortunately, MacGregor's description is meager and the appliance is not illustrated. This new apparatus will be of much interest to all laryngologists who have the welfare of their patients at heart.

In an analysis of the psychologic factors determining the success or failure of the rehabilitation program of the laryngectomized patient Stoll¹⁰² is of the firm opinion that the personal equation is all important. He cites the extrovert's eagerness to learn esophageal speech quickly and to show how well he can speak, whereas the introvert has much difficulty not only with speech production but also with readjusting emotionally to loss of the voice box.

In a discussion on rehabilitation after laryngectomy Moses¹⁰³ thinks the ideal treatment for these patients will be through the joined forces of the surgeons and medical voice therapists who are able to do more than just teach the patient to belch esthetically. He believes that new methods must be developed for therapy and control by gaining deeper insight into the patient's problems and by careful observation and diagnosis. Moses does not think that a laryngectomized patient is the proper type of individual to teach voice therapy.

All laryngologists will concur with Putney¹⁰⁴ that carcinoma of the larynx should be completely removed without regard for the subsequent establishment of a voice. A voice can be developed whether the larynx is removed with no contiguous tissue or with the surrounding structures. In order to determine what factors, if any, had a bearing upon failure to develop a voice from an anatomic or physiologic standpoint after laryngectomy, Putney reviewed 440 cases of patients operated upon at Jefferson Hospital. No underlying anatomic

or physiologic factor was found to account for lack of voice, and patients with extensive surgical removal including most of the pharynx and portions of the tongue as well as the larynx were able to talk expertly. The type of cervical incision, the method of pharyngeal closure, or the amount of adjacent cervical tissue excised had no appreciable effect upon establishment of a voice. Putney concludes that the primary object in the surgical treatment of carcinoma of the larynx is complete eradication of the malignant tumor, regardless of the sacrifice of adjacent tissue.

Conley¹⁰⁵ presents a modification and development of the technique described in 1958 for vocal rehabilitation of the laryngectomized patient. Instead of the mucosal tunnel fashioned from the anterior wall of the cervical esophagus, an autogenous graft of the great saphenous vein, 8 cm. in length, is used to connect the skin of the neck just above the tracheal stoma with the lower portion of the cervical esophagus. A special laryngectomy tube then connects the tracheal airway to the venous tract.

In primary implantation of the vein graft a No. 8 catheter or plastic tube threaded through its lumen and then inserted into a specially adapted trochar simplifies threading through the fascia between the trachea and esophagus. In secondary implantation perforation is made through a fenestrated short esophageal speculum. The most troublesome complication of the procedure is closing of the vein, due to neglect by the patient and low grade infection.

In a discussion of the technical aspects of speech aids for post-laryngectomized patients Barney¹⁰⁶ first presents the desired objectives from the viewpoint of the patient. Since surgical introduction of a transducer into the pharynx is impractical, the only two possible alternatives are to conduct the sound into the mouth through a tube, or by means of a vibrating driver applied to the outside of the throat. Hope is expressed that with the development of electronics new aids for laryngectomized patients will be forthcoming.

In an attempt at voice rehabilitation Pressman¹⁰⁷ proposes

for subtotal laryngectomies, a technique whereby it is possible to remove almost the entire larynx and yet retain a normal airway. Three principles are necessary to accomplish this: 1. to create a lining, 2. to provide a lumen, and 3. to lend rigidity. The first of these is accomplished by using the external perichondrium of the thyroid for a lining, and a proper sized obturator creates and maintains a lumen and transplantation of thyroid alae from a cartilage bank. Pressman reports encouraging results with maximum voice rehabilitation after 18 months.

Briess¹⁰⁸ describes the specific therapeutic approach used for restoration of normal dynamic equilibrium of the intrinsic and cricothyroid muscles which control the functions of the vocal cords. This therapy is considered in four phases and individual muscle function is discussed thoroughly. Psychogenic factors usually intensify existing muscle imbalance. This and other voice problems are discussed in detail. To those interested in voice production this paper is highly recommended.

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COURSE IN ALLERGY.

The Post Graduate School of the University of Texas and The Baylor University College of Medicine will present a course in Allergy to be conducted by Herbert J. Rinkel, M.D., January 30th through February 3rd in Houston, Tex.

The course will be followed by a meeting of the Gulf Coast Allergy Study Group on February 4th and 5th.

For further information, write to: Office of the Dean, University of Texas Post Graduate School of Medicine, 410 Jesse Jones Library Bldg., Houston 25, Tex.

PARTIAL PHARYNGECTOMY AND NECK DISSECTION FOR POSTERIOR HYPOPHARYNGEAL CANCER.

Immediate Reconstruction with Preservation of Voice.*

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INTRODUCTION.

Malignancies of the posterior wall of the hypopharynx are uncommon and carry a poor prognosis.^{1,6,7,10,17} In the past, surgery was considered only in early cases or in the form of a combined excision of pharynx and larynx with reconstruction of a skin-lined gullet, sometimes requiring multiple procedures.^{10,17} This removal of a normal larynx,¹³ only because adjacent structures were diseased, has led surgeons to attempt to preserve laryngeal function and at the same time eradicate the tumor by a more conservative approach.^{3,4,12,14} We have had success with wide local excision of such tumors, preserving the larynx and reconstructing the pharynx primarily by means of stents, skin grafts and muscle flaps.

HISTORICAL REVIEW.

In the Anglo-American literature these lesions have been treated mainly by irradiation.^{1,8,21} When they have been

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Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication Aug. 29, 1960.

treated surgically the larynx and pharynx have generally been removed.^{5,13,16,19} Simple excision has been done.⁷ Irradiation had been used for treatment primarily because of surgical difficulties.⁶ High dose therapy carries the possible dangers of transverse myelitis, cartilage and bone necrosis.⁸

We feel that adequate excision of the tumor and its potential field of spread with primary reconstruction of the pharynx, and preservation of the larynx, is feasible and practical in certain carefully selected cases.

Conservation has been described in surgery of the hypopharynx, but the term was usually used in reference to saving mucosa and uninvolved laryngeal tissue to reconstruct the pharynx and esophagus but did not refer to conservation of laryngeal function.⁷ Total laryngopharyngectomy with or without neck dissection has been the recommended surgical procedure if the tumor is large.^{5,16,19}

PATHOLOGY.

Tumors in the pharynx, especially those of the posterior wall, tend to be multicentric in time and space.²⁰ There may be a large differentiated tumor mass with areas of carcinoma *in situ* adjacent to, but separate from, the main lesion. These satellite areas are usually but not always close to the main lesion; hence we feel that a one-and-a-half to two centimeter margin of normal pharynx should be excised with the tumor. The remaining pharyngeal mucosa may possibly develop malignancy at a later date even though none is present at surgery; however, we do not feel that prophylactic excision of the total pharynx is warranted. The lymphatic drainage of the posterior and lateral pharynx is lateral to the cervical nodes and not toward the larynx.^{8,21} Involvement of the larynx in advanced cases is due to retrograde spread or local invasion. It would, therefore, seem that adequate excision of the tumor with a good margin of safety would give as good results as total excision of the larynx and pharynx.

Recently preliminary work on laryngeal pathology suggests that the characteristics of the advancing margin of the tumor may influence the prognosis. This has been more extensively

studied in the breast and colon lesions,² and seems to hold true for the larynx and pharynx also.

Tumors may present a "pushing" margin or an invasive infiltrating margin when slides are examined under a low magnification. The "pushing" tumors so far appear to have a much better prognosis;^{14,20} however, this characteristic cannot be distinguished on the usual biopsy specimen.

Node metastases in the neck from posterior wall lesions are very frequent¹¹ (50 per cent according to Moss⁶). In this institution the recommended treatment for lymph node metastases has been surgery, because it is felt that cancerocidal doses of therapy cannot be given adequately to the entire neck field (Powers¹⁸).

SURGICAL CRITERIA.

The method proposed is advocated for tumors on the posterior wall of the laryngopharynx with or without involvement of the lateral wall of the hypopharynx, extending from above the cricopharyngeus to the level of the tip of the epiglottis or higher. This does not include lesions involving the oropharynx.

It is essential that the exact extent of this tumor be established. Laryngograms¹⁵ are of valuable assistance in determining the superior and lateral extent but do not help to demonstrate the inferior border when tumor is near the cricopharyngeus. A barium swallow does not usually delineate the posterocoid and cricopharyngeal area satisfactorily. Only by direct laryngoscopy and esophagoscopy can involvement of the cervical esophagus be ruled out. This area must be free of tumor to allow an adequate margin of excision of normal mucosa.

Films of the cervical vertebrae are taken to rule out bony involvement. The tumor must be *mobile* over the bony posterior wall. This must be established at the direct examination. Portions of the ligamentum may be excised, but this usually is not required.

A radical neck dissection is done on the side of major in-

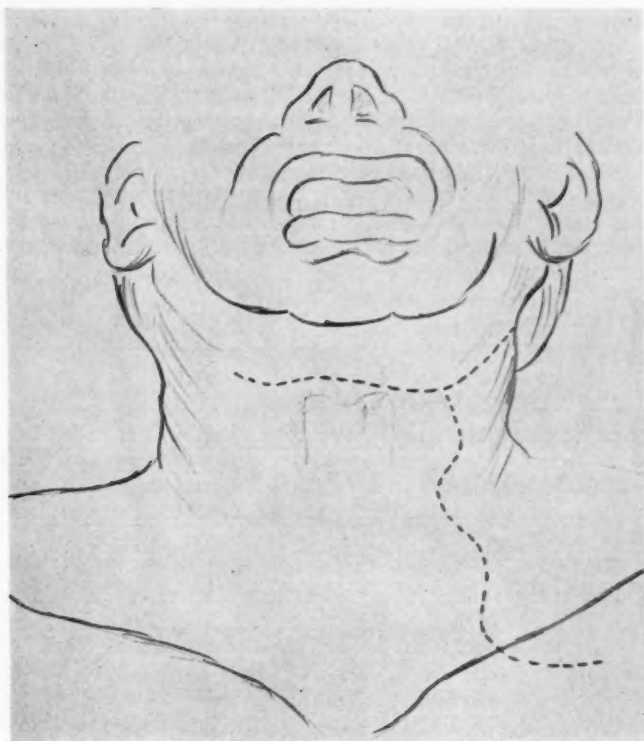


Fig. 1. Skin incision.

volvement even if nodes are not palpable. If these are palpable on one side, this side is dissected even if it be the side of minor involvement. If nodes are palpable on both sides a staged bilateral neck dissection is done, or if in one operation, sparing the jugular vein on the least involved side. The pedicle is left attached posteriorly from the level of the hyoid to the lower border of the tumor.

Lesions under 1 cm. in diameter may be excised in continuity with radical neck dissection and the defect closed primarily. When dealing with larger lesions a thick split thickness skin

graft and stent are required. If the lesion extends significantly on to the lateral hypopharyngeal wall, a scalene musculo-fascial flap from behind the carotid sheath is mobilized to provide a partial bed for the graft and to reconstruct the lateral wall.

SURGICAL TECHNIQUE.

Patient is prepared and draped while awake and a vertical tracheostomy is done. General anesthesia is started and a Y-incision is made with the anterior limb of the Y extended to the midline at the level of the hyoid bone (see Fig. 1).

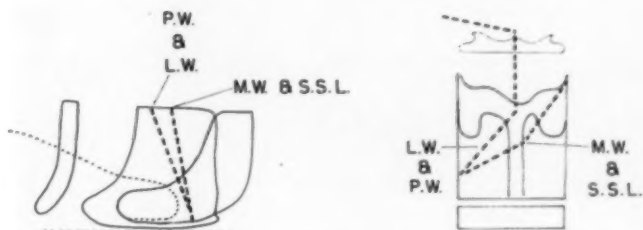


Fig. 2. Thyroid cartilage transection variations. PW—Posterior wall of hypopharynx; LW—Lateral wall of hypopharynx; MW—Medial wall of pyriform sinus; SSL—Supraglottic subtotal laryngectomy.

The customary radical neck dissection is done on the major side and the pedicle left attached from above the hyoid to the lower border of the tumor. The hyoid is divided in the midline, and the suprahyoid muscles divided from the cornu. Cutting the stylohyoid ligament allows better exposure of the pharynx which is entered through the vallecula on the involved side. The tumor is then visualized and inspected but not deliberately palpated in order to avoid unnecessary tumor spread. The thyroid cartilage is sectioned and the superior cornu and part of the adjacent ala removed (see Fig. 2). A vertical incision is made in the pharynx antero-lateral to the tumor, leaving at least 2 cms. margin. The tumor is then excised (see Fig. 3). Small defects can usually be closed *per primum*. Larger defects require a thick split thickness skin graft. This is sutured in place with 0000 silk

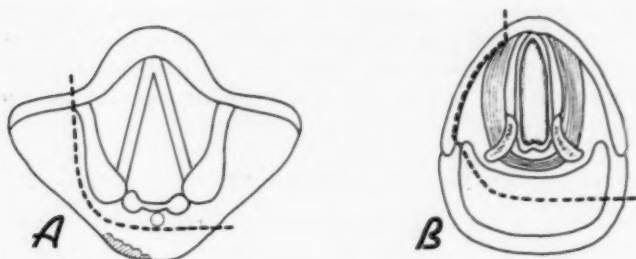


Fig. 3. A.—Mirror view of area of transection. B.—Cross section at level of glottis.

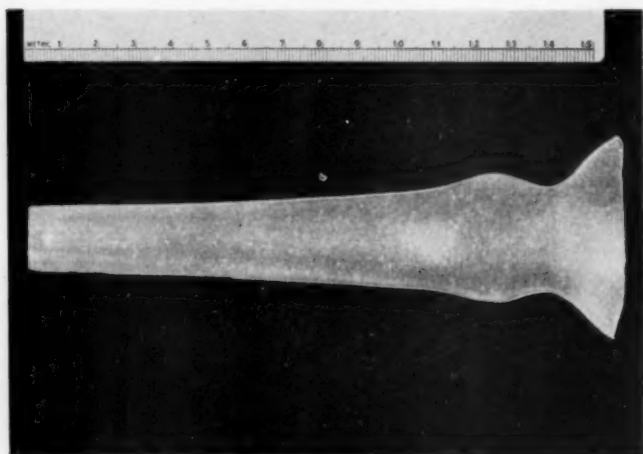


Fig. 4. Negus stent.

because there is less reaction of the silk to the saliva. The sutures slough out spontaneously in several weeks. In our experience skin grafts always take very well on the posterior wall. A Negus^o stent is placed, and a feeding tube is inserted through this into the stomach (see Fig. 4). The stent remains in place for two to three weeks. This is sufficient time, because stenosis is not a problem here.

If the excision involves a considerable portion of the lateral

wall of the hypopharynx, a graft will be needed laterally as well as posteriorly (see Fig. 5). This portion of the graft requires a bed, and this can be formed by rotation anteriorly of a musculo-fascial flap from the scalene group, with preservation of the cervical plexus. This flap serves to reconstruct the lateral wall of the pharynx. The carotid sheath is retracted laterally, and the anterior scalene muscle is freed



Fig. 5. Operation defect. Skin graft to posterior of hypopharynx.

above and below the line of the lesion. This flap is hinged medially and is rotated anteriorly (see Fig. 6). The graft is sutured to the posterior wall and to the muscle flap. When the flap is swung into position over the stent, the graft is sutured to the remaining mucosa of the lateral wall of the pyriform sinus and the external perichondrium of the remaining thyroid cartilage. The muscles are closed with two layers of interrupted 000 silk. A feeding tube is inserted through the stent, and the latter is left in place for at least three weeks. Penrose drains are used, and the wound is closed with interrupted subcutaneous and skin sutures of silk.

A nasopharyngeal catheter is used for continuous suction of saliva for the first few days postoperatively.

POSTOPERATIVE REHABILITATION.

If no stent has been used, the patient begins to swallow in seven to ten days with a smaller but plugged tracheostomy tube in place. Within a few days it is usually possible to remove the feeding tube and the tracheostomy tube as well.

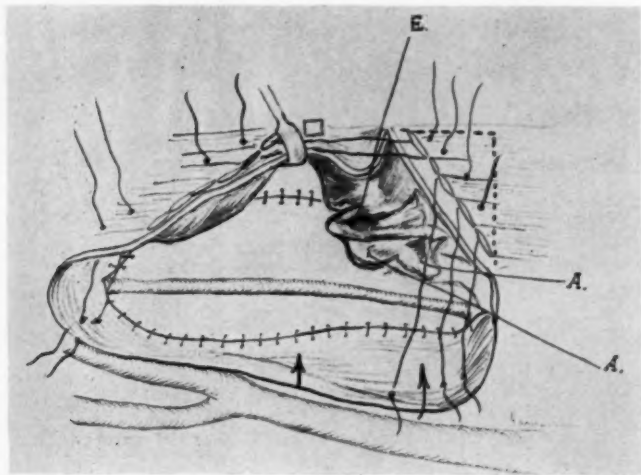


Fig. 6. Line drawing of Fig. 5 which shows area of musculo-fascial lined by skin graft for closure of the pharynx. E—epiglottis; A—arytenoid.

When a graft and stent are used, approximately three weeks are required for healing and, therefore, swallowing and speaking are delayed due to the presence of the stent.

The larynx has not been routinely occluded; however, the pulmonary complications have not been significant with this procedure. When healing is completed the stent is removed, and the patient begins to swallow. This is difficult at first but soon becomes adequate.

There may be some persistent discomfort with pharyngeal secretions because of the rigidity of the posterior pharynx and the restriction of normal mobility of the larynx. The fact that the graft is skin and not mucosa and so is devoid of glands also contributes to the difficulty. Preliminary studies of the cineradiography of swallowing of patients who have had partial pharyngectomy suggest that hypertrophy or relative spasm of the cricopharyngeus muscle may contribute to the sometimes awkward handling of the secretions that persist for some time in a few of these patients.

In time, the graft appears to change its characteristics and becomes more pink, suggesting a possible metaplasia or reversion to a mucosal type lining; however, no histologic evidence is forthcoming at this time.

DISCUSSION OF CASES.

Six patients have been operated by this method in the last three years, and all had lesions of the posterior wall of the laryngopharynx. Four of them had clinically palpable nodes, and one clinically negative neck had microscopic metastases. One patient presented with bilateral clinical cervical metastases, and a staged bilateral neck dissection was performed. Skin graft and stent were used in four cases; skin graft alone was used in one patient and primary approximation of the mucosa was accomplished in one instance.

The size of the lesion varied from 1x0.5 cms. to 3x4 cms. Of these, three were "pushing" type tumors and three were infiltrating.

The stent was left for three weeks, and the patients were discharged from the hospital by the fourth week, swallowing adequately. One patient was lost in the immediate post-operative course from an unexpected cardiac death.

The longest survival free of disease has been three years; there has been no local recurrence to date. There were no significant pulmonary complications, and the laryngopharyngeal functions have been satisfactory in the remaining five cases (see Fig. 7).



Fig. 7. Specimen and postoperative photograph of patient (partial pharyngectomy and bilateral staged neck dissection).

SUMMARY.

Certain cases of posterior pharyngeal wall tumors may be successfully treated by surgery but without sacrifice of the voice.

A neck dissection is performed in continuity with the local excision and the defect in the pharynx is closed primarily, or by the use of skin grafts, muscle flaps and stents.

Accurate localization of the tumor is essential. A series of six cases is presented and discussed.

The short term results in five of six patients extend to three years.

CONCLUSION.

A composite method of excision and immediate reconstruction is presented for the treatment of posterior pharyngeal wall malignancies allowing preservation of laryngopharyngeal function.

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KAPOSI'S SARCOMA OF THE AURICLE.*

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and

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Kaposi's¹ sarcoma is a disease entity familiar to dermatologists. Since there are few recorded instances where the disease has presented itself first in those areas of special concern to the otolaryngologist, a case recently encountered by the authors is reported and discussed in detail.

CASE REPORT.

A 68-year-old white male cook of Greek birth attended the Ear, Nose and Throat Department of the University of Chicago Clinics on February 8, 1960, complaining of a slowly growing small blue lump on his right ear. It had been present for the last four months and had not been associated with pain or bleeding. In 1951 the patient had had similar lumps removed from a different area of the same ear at another hospital.

Physical examination of the ears, nose, and throat revealed no abnormality except for the presence of a firm blue non-tender nodule on the anterior helix of the right pinna measuring 5x3x3 mm. Family history, past history, routine blood work including serology, and urinalysis were unremarkable. A tentative diagnosis of chondroma or hemangioma was made. On February 11, 1960, an excisional biopsy was carried out under local anesthesia. The incision healed well, and sutures were removed on the fifth day.

Pathology.

Inspection of the gross surgical specimen, which measured 1.4x1.0x0.6 cm., suggested that the tumor was well circumscribed. The tumor itself was 0.5 cm. in diameter, felt firm and nodular, and appeared to be partly encapsulated. The cut surface of the specimen was tan in color, smooth and homogeneous in texture.

Microscopically the lesion consisted of one large fairly distinct nodular mass and two satellite nodules separated from the main mass by incomplete fibrous tissue trabeculae. The lesion, which was limited to the subepidermis, was circumscribed and readily distinguishable from the adjacent dermal connective tissue, from the slightly thinned out but intact epidermis above, and from the uninvolved cartilage below. The tumor consisted of fibroblasts which tended to be plump and only occasionally assumed a marked elongated shape. There were occasional mitotic figures, and erythrocytes were observed in the interstitial spaces of the tumor and in its numerous thin-walled vascular channels. Local-

*From the Section of Otolaryngology of the University of Chicago.

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication May 21, 1960.

ized accumulations of hemosiderin were demonstrated throughout the tumor when sections were stained for iron. These accumulations were most numerous at the periphery of the tumor.

The gross and microscopic picture described led to a pathological diagnosis of Kaposi's sarcoma. This diagnosis prompted a more detailed investigation of this case. The patient's entire skin was scrutinized, but the only additional lesions found were two small areas of blue coloration, one on the helix of the left ear, the other on the lower lip; each were about 1 mm.² Extensive clinical pathological examinations were also made, including studies of liver function, blood non-protein nitrogen, plasma proteins, and alkaline phosphatase; all examinations gave results

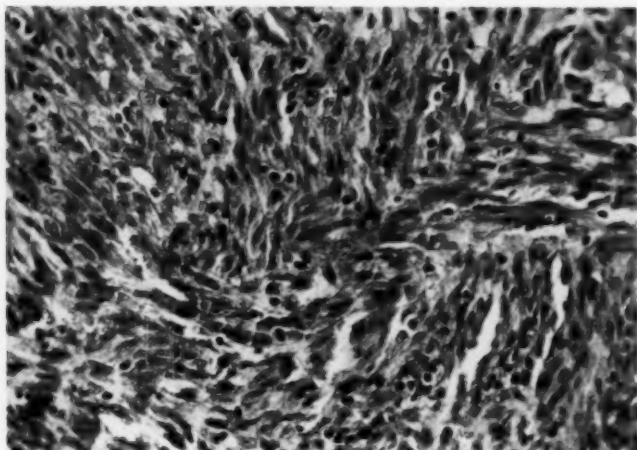


Fig. 1. Main tumor and two adjacent smaller tumors, separated by fibrous trabeculae. The tumors are limited to the dermis and do not involve epidermis or cartilage. (25X, H. and E.)

within normal limits. The differential white cell count showed a 10 per cent monocyte and 11 per cent eosinophil count, while total red and white cell counts and hemoglobin were within normal limits.

Three small painless tumors had been excised from the medial aspect of the same auricle nine years earlier. Examination of the tissues removed revealed the same pathological features as those found in the recent specimen.

DISCUSSION.

The etiology of this disease, first described by Kaposi¹ in 1872, is still a matter of controversy. The tumor has been said, by various authors at various times, to originate from a

number of different cell types including fibroblasts,² perithelial and endothelial cells, myoneural structures of the glomus³ and reticulo-endothelial elements.⁴ Most investigators agree that the tumor is usually multicentric in origin and may metastasize in its advanced sarcomatous stage. It primarily affects blood and lymph vessels and most commonly arises in the dermis of the skin; changes in the epidermis are secondary. Visceral growths without accompanying cutaneous manifestations are well recognized.⁵

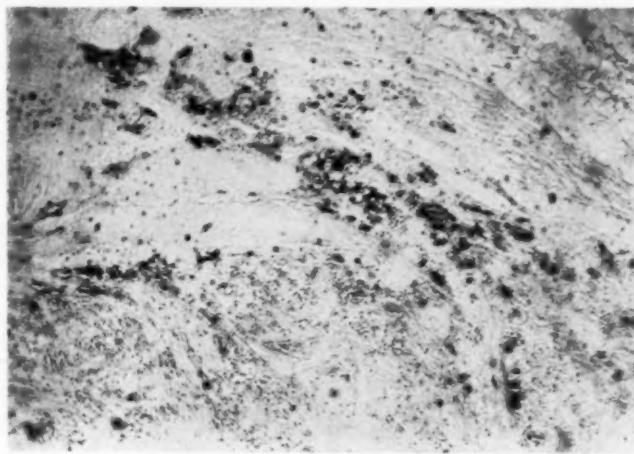


Fig. 2. Main tumor, showing many plump fibroblasts and small slit-like vascular spaces. (450X, H. and E.)

Kaposi's sarcoma occurs predominantly in males in the sixth and seventh decades of life,⁶ a large percentage of sufferers are of central European stock, and the disease is most common in manual laborers.⁷ The tumor usually involves the extremities and is often bilaterally symmetrical. It starts as a bluish, bluish-red, or reddish-brown nodule or plaque and is slowly and intermittently progressive. A number of these plaques may coalesce and reach large proportions. The lesions are usually painless, and ulceration is rare. Edema of the extremities may develop as a result of obstruction to lymph

flow. In decreasing order of frequency, Kaposi's sarcoma involves the skin, gastro-intestinal tract, external genitalia, lymph nodes, liver, lungs, then almost every other organ of the body.⁸

Blood studies are normal in the majority of cases; however, increases in circulatory monocytes and eosinophils, as found in the authors' case, have been reported.^{4,5,6} Dorffel⁴ explains this finding by theorizing that monocytes are released

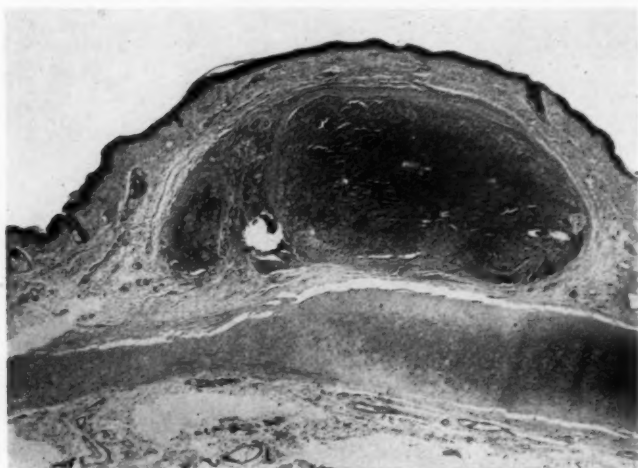


Fig. 3. Section from the periphery of the main tumor demonstrating the characteristic abundance of iron pigment. (145X, Prussian Blue.)

into the blood stream in increased amounts from the endothelial cells lining the blood vessels of the tumor; these monocytes may or may not derive from the tumor's monocytic perivascular infiltrate.

Other systemic diseases have been observed in association with Kaposi's sarcoma although no definite relationships have been established. These include mycosis fungoides,⁹ lymphatic leukemia,¹⁰ lymphosarcoma,¹¹ Hodgkin's disease⁵ and even carcinoma. Diabetes mellitus also commonly occurs in patients with Kaposi's sarcoma.¹²

Reports of the duration of life, after initial appearance of the tumor, vary from one month² to 48 years¹³ with average figures of from five to ten years.^{4,14}

Dorffel⁴ claims that the microscopic development of Kaposi's sarcoma may be divided into five stages. The earliest changes are engorgement and dilatation of blood vessels, hemorrhage, and deposition of hemosiderin. Then follows perivascular infiltration of monocytes, histocytes and plasma cells; proliferation of blood vessel endothelium occurs later, with the formation of imperfect capillaries. In the third stage angiomatous features predominate, and the tumor may resemble a cavernous hemangioma; spindle cells may also proliferate and lead to sarcoma-like appearance. In the fourth stage the microscopic appearance is that of an angiosarcoma or fibrosarcoma with numerous cells showing mitotic activity. Occasionally a fifth stage, one of involution, is reached; this stage is characterized by vacuolization of nuclei, cellular fragmentation, and fibrosis. All developmental stages of this tumor may be found adjacent to one another in a single specimen whether it be from the skin or from a visceral organ.¹⁵ Hemosiderin is always present in these tumors, a feature distinguishing them from true fibrosarcoma.

Radiation therapy has been considered the treatment of choice since the tumor is radiosensitive.¹⁴ Superficial lesions have been treated successfully with low voltage at a dosage rate of 75 r weekly for four to 12 treatments.⁶ Arsenicals, given orally or intramuscularly, may be helpful.^{6,14} In the case presented, the lesion was removed surgically because a pathological tissue diagnosis was sought.

It is most unusual for this disease to originate on the auricle, examination of the literature revealing only three such cases.^{2,16,17} Otherwise many of the clinical features commonly found in Kaposi's sarcoma were present in the case presented, *i.e.*, age, sex, place of birth, type of work, and relative monocytic and eosinophilic leucocytosis. The nine year interval between surgical removal and reappearance of an adjacent tumor suggests multicentric origin rather than metastasis.

SUMMARY.

A case of Kaposi's sarcoma is presented in which the only lesion, one of about four months' duration, was found on the auricle. Similar lesions had been excised from a different area of the same auricle nine years previously. The symptoms, physical signs, histological features and etiology of the disease are discussed in brief.

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SPEECH AUDIOMETRY: A DISCRIMINATION TEST FOR SPANISH LANGUAGE.*

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A test of hearing function may have three main purposes: 1. diagnosis and prognosis of ear disease; 2. evaluation of medical, surgical and/or hearing-aid therapy; 3. determination of hearing impairment. Pure-tone audiometry is one kind of test for these purposes; but its value is limited, especially in the diagnosis of certain types of deafness, in therapeutic evaluation, and in hearing-aid recommendation.

Tests using speech as the auditory stimulus are valuable because: 1. they confirm the clinical findings of the pure-tone audiogram; 2. they give diagnostic and prognostic information not given by the pure-tone test; 3. they give a more valid estimate of practical hearing in everyday life.¹⁰ In general, if word lists are presented to a listener through earphones or a loudspeaker, the percentage of correct responses increases as intensity increases. That intensity at which the subject can repeat correctly 50 per cent of the words given is known as the threshold of intelligibility. As the intensity is further increased, the percentage of correct answers will increase proportionally until it reaches the maximum level, called the discrimination score. The graph showing the percentage of correct words on the ordinate as a function of intensity on the abscissa is known as the *articulation curve* (see Fig. 2).

CLINICAL TESTS.

There are two types of auditory tests using speech as a stimulus that are well known and used clinically: the first determines the threshold of intelligibility, or the level at which

*This work was carried out with partial support from NIH Grant B-1854 (NINDB).

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication May 15, 1960.

the normal subject correctly repeats 50 per cent of the material. Conventionally this intensity level is considered 0 db hearing level for speech. The deviations from this reference yield *hearing level for speech* for different individuals. In many languages the speech material considered best for this threshold test is that which makes the steepest articulation curve and contains items homogeneous with respect to intelligibility. In English, the ideal material consists of two syllables with equal stress on both (spondees). The second type of test, known as the articulation or discrimination test, gives the maximum score of correct words at a high intensity. This test, at least in the United States, has proved to be of great value in differentiating a conductive from a non-conductive hearing loss, besides giving other diagnostic and prognostic information. This paper deals with the discrimination test as it has been constructed in several languages, including Spanish, and presents a new kind of Spanish speech material.

EXISTING SPEECH TESTS.

A review of the speech tests in nine languages—English, German, Danish, Swedish, Hebrew, Italian, French, Finnish, and Portuguese—shows that more or less the same criteria are used in the construction of test lists for discrimination:^{2,4}

- a. Monosyllabic structure.
- b. Equal phonetic composition.
- c. Representative distribution of sounds of the given language (phonetically balanced).
- d. Equal range and average difficulty.
- e. Words of common usage.

In recent years a new criterion has been added in the United States in order to have a more useful hearing test:^{6,10}

- f. Intelligibility of the speaker.

In Spanish, very little has been added since Tato's work published in *Laringologica*, Volume I, Number 1, in 1948, and

later as an appendix in his book "Lecciones de Audiometria" in 1949.¹¹ In this work, which I consider a foundation of Latin American audiology, Dr. Tato makes a very thorough study of Spanish phonetic composition and concludes that: 1. the Spanish language has typically bisyllabic, tetraphonemic words, with a slight predominance of the consonants over the vowels (one vowel to 1.12 consonants); 2. it is very difficult to make a monosyllabic word list in Spanish because of the lack of monosyllabic nouns; 3. a list of trochaic words correlates well with the English spondees as has been demonstrated by oscillographic studies.¹¹

Based on these conclusions and early work in English on the subject, Dr. Tato constructed three types of lists:

a. Twelve phonetically-balanced lists with 25 trochaic words in each.

b. Five lists of 15 trochaic, disyllabic words each, not phonetically balanced and used to determine the intelligibility of the consonants relative to the vowels.

c. Three lists of 50 monosyllabic words each, without phonetic balance, which are "difficult at low levels."

Using his phonetically-balanced lists of bisyllabic words, Dr. Tato then determined the articulation curve for Spanish on five listeners at Central Institute for the Deaf. Comparing the curve obtained for Spanish disyllabic words with the one obtained for English with monosyllabic words, Dr. Tato concludes: "In the same circumstances we obtain an equal percentage of English with 10 db less intensity. Thus a given person would be more deaf to English than to Spanish."

There are some criticisms to make of Dr. Tato's work: in the first place, there is no clear specification of the clinical use for the material.⁶ Second, the articulation curve depends, among other things, on the kind of material used (*i.e.*, the greater the number of syllables in the word, the steeper the curve will be). Thus Dr. Tato's conclusions relative to the steepness of the Spanish curve could be due to the different speech material used in the test. The articulation curve is

also influenced by the intelligibility of the speaker. It has been found that by using a speaker with good intelligibility, a steeper curve can be obtained than the one classically known for PB lists.⁶

A third criticism resulted from my experience in the Diagnostic Department of the Instituto Venezolano de la Audicion y el Lenguaje (Venezuelan Institute of Speech and Hearing) in Caracas. Initially we used Dr. Tato's phonetically-balanced lists as a discrimination test, to help in differential diagnosis of deafness. We had somewhat better success when we

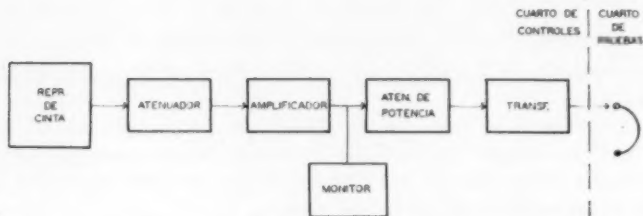


Fig. 1. Block diagram of the equipment used. Note: The speech test was actually administered to each subject in the Soundproof Room, Lester N. Hofheimer Audiology Laboratory, Department of Otolaryngology, Washington University School of Medicine, St. Louis.

changed to monosyllabic lists; however, Berruecos, Faria and Fernandez (1952), working with Tato's PB lists found that the threshold of intelligibility differs only 1 db from that found by Dr. Tato in 1949.⁹ Although the material we have in Spanish is adequate to determine the threshold for speech, we need new and more difficult material to utilize as a discrimination test.

A DISCRIMINATION TEST FOR SPANISH LANGUAGE.

In May, 1959, we experimented with the use of nonsense-syllable lists for this purpose. We used nonsense syllables because: 1. our interest in the measurement of a person's ability to hear spoken language does not require that we investigate the meaning of words⁵; 2. in the study of intelligibility, the nonsense syllable is ideal material because it focuses

TABLE I.
Percentage of Correct Responses.
List No. 1.

	Per Cent at 20 db	Per Cent at 30 db	Per Cent at 40 db	Per Cent at 50 db	Per Cent at 60 db
Subject No. 1	20	24	78	72	90
Subject No. 2	12	28	74	90	94
Subject No. 3	66	52	80	96	98
Subject No. 4	0	4	60	82	80
Subject No. 5	8	22	82	92	92
Subject No. 6	50	58	74	78	82
Subject No. 7	24	60	84	84	88
Subject No. 8	4	28	72	84	88
Subject No. 9	18	62	70	90	94
Subject No. 10	4	56	80	94	90
Subject No. 11	22	72	86	88	94
Mean	21	42	76	86	90

TABLE II.
Percentage of Correct Responses.
List No. 2.

	Per Cent at 20 db	Per Cent at 30 db	Per Cent at 40 db	Per Cent at 50 db	Per Cent at 60 db
Subject No. 1	48	22	80	86	94
Subject No. 2	4	20	78	86	100
Subject No. 3	36	70	90	96	96
Subject No. 4	0	6	54	88	94
Subject No. 5	16	40	74	94	96
Subject No. 6	14	52	82	80	78
Subject No. 7	12	50	80	90	94
Subject No. 8	14	38	58	94	92
Subject No. 9	14	40	78	88	94
Subject No. 10	40	48	78	94	96
Subject No. 11	36	80	90	94	96
Mean	21	42	77	90	94

the interest of the listener on the intelligibility of the specific phonetic elements, and since the words are meaningless, they are in no way dependent upon the vocabulary of the listener; 3. it is easy to construct lists of phonetically-balanced nonsense syllables; 4. the Spanish language is essentially phonetic, which permits the subject to transcribe graphically the sounds he hears.

The criteria established for a discrimination test were: 1. nonsense-syllable list; 2. phonetic composition representa-

TABLE III.
Percentage of Correct Responses.
List No. 3.

	Per Cent at 20 db	Per Cent at 30 db	Per Cent at 40 db	Per Cent at 50 db	Per Cent at 60 db
Subject No. 1	20	50	86	88	94
Subject No. 2	2	24	78	86	92
Subject No. 3	64	64	84	90	98
Subject No. 4	0	6	58	88	90
Subject No. 5	10	22	68	92	94
Subject No. 6	14	56	82	88	86
Subject No. 7	8	44	94	94	94
Subject No. 8	6	24	64	86	98
Subject No. 9	10	50	76	84	94
Subject No. 10	8	50	84	92	100
Subject No. 11	32	60	84	98	98
Mean	16	41	74	90	94

TABLE IV.
Percentage of Correct Responses.
List No. 4.

	Per Cent at 20 db	Per Cent at 30 db	Per Cent at 40 db	Per Cent at 50 db	Per Cent at 60 db
Subject No. 1	46	38	64	78	84
Subject No. 2	6	34	76	94	98
Subject No. 3	34	62	92	94	100
Subject No. 4	0	8	34	90	90
Subject No. 5	10	22	70	88	96
Subject No. 6	22	58	82	84	84
Subject No. 7	6	50	76	92	90
Subject No. 8	4	18	68	90	100
Subject No. 9	12	28	77	86	92
Subject No. 10	36	36	70	92	96
Subject No. 11	16	82	90	94	96
Mean	17	40	71	93	93

tive of the Spanish language; 3. equal phonetic composition in all lists. A criterion of difficulty was not established.

Construction.

Four lists of 50 nonsense syllables each were made according to a consonant-vowel-consonant pattern following the phonetic proportion established by Dr. Tato in the initial consonant and the vowel, but not in the final consonant; however, in some instances, in order to include the single "r" in the proportion indicated by Tato, the vowel-consonant-con-

sonant pattern was used (example, "urp"). The phonetic composition among the lists was maintained the same.

Subjects.

Eleven Spanish-speaking subjects, representing seven Latin American nationalities, were used. They varied in age from 16 to 48 years. Their hearing levels, tested on a Beltone Audiometer Model 15A, were between -10 and -5 db, relative to American Standard. All subjects but one were inexperienced with speech tests.

TABLE V.
Means of All Subjects.

	Per Cent at 20 db	Per Cent at 30 db	Per Cent at 40 db	Per Cent at 50 db	Per Cent at 60 db
List No. 1	21	42	76	86	90
List No. 2	21	42	77	90	94
List No. 3	16	41	74	90	94
List No. 4	14	40	71	92	93
Mean of All Lists	19	41	75	90	93

Recording of the Material.

The lists were recorded by the author as speaker on magnetic tape at a speed of 15 in/sec. on an Ampex Model 400 recorder. A 1,000 cps tone was recorded on each tape as a reference level. Each list was preceded by the following recorded instruction in Spanish: "You will hear immediately a nonsense-syllable list. Listen carefully and try to repeat each sound. Are you ready?" Ten seconds later the subject heard the carrier phrase: "Repeat the word ——."

Method.

In the first experimental session the subject was informed in detail about the nature of the test, the goals we wished to accomplish, and what would be expected of him. Then we made a brief otological examination and a pure-tone audiogram. A block diagram of apparatus used for the listening tests is shown in Fig. 1. In order to minimize the effects of learning, all four lists were first given at an intensity level of 60 db SPL, and a record was kept of the answers.

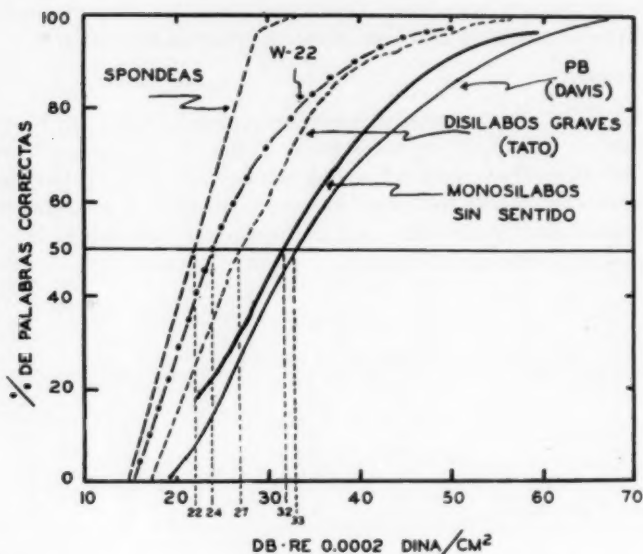


Fig. 2. This graph shows the relation between the kind of speech material used and the corresponding articulation curve obtained.

The curve "spondees" is the classical curve obtained with English bisyllabic spondee words.

The curves "W-22" and "PB(Davis)" were both obtained with English phonetically-balanced monosyllabic word lists, the "W-22" curve being recorded by a speaker with better intelligibility.

The curve "disilabos graves(Tato)" was obtained by Dr. J. M. Tato with Spanish phonetically-balanced trochaic word lists.

The curve "Monosilabos sin sentido" was obtained with the nonsense syllable material discussed in this paper.

During the next two (in some cases three) sessions each list was given at four different intensities: 20, 30, 40, and 50 db SPL. Thus each subject received the lists 16 additional times. The order and intensity level at which each list was presented to each subject was randomized.

RESULTS.

Tables I to IV show the percentage of correct answers for each subject on each list. Table V shows the means of these percentages for each list at different levels, as well as the

TABLE VI.
Standard Error of Percentage for the Four Lists at the Five
Intensity Levels.

Lists	Levels				
	20 db	30 db	40 db	50 db	60 db (spl)
1	12.3	14.9	12.9	10.4	9.0
2	12.3	14.9	12.6	9.0	7.1
3	11.0	14.8	13.2	9.0	7.1
4	11.3	14.7	13.6	7.6	7.6
Mean	11.8	14.8	13.0	9.0	7.6

TABLE VII.
Analysis of Variance for the Four Lists Related to the Five
Intensity Levels.

Source	df	SS	MS	F
Lists (L)	3	453.36	151.12	1.2038*
Levels (I)	4	184,252.08	46,063.02	366.919†
L × I	12	800.06	66.67	0.531*
Cells	200	25,108.18	125.54	
Total	219	210,613.68		

*Statistically insignificant.

†Statistically significant, as it should be expected.

average for all levels. This latter result is shown graphically in Fig. 2.

Tables VI and VII show a statistical resume of the results.⁷ Table VI shows the standard error of the percentage for the four lists related to the five intensity levels. Table VII shows in summarized form the variability of the four lists related to the five intensity levels. From this analysis we may conclude that the variability among the lists is very small and their homogeneity is great. This is important from the clinical point of view because it permits us to use the lists interchangeably.

COMMENT.

According to these results it can be said that the nonsense-syllable lists proved to be more difficult material than the disyllabic phonetically-balanced lists made by Dr. Tato (see Fig. 2), hence this test may be useful as a discrimination test with the diagnostic purpose of differentiating between a

conductive hearing loss and a non-conductive hearing loss; however, in spite of the homogeneity shown by the statistical analysis, the value of the test in differential diagnosis can be assessed only after its use in the clinic and a careful evaluation of the results. This will be the basis for future study.

ACKNOWLEDGMENT.

I express my gratitude to Dr. Ira J. Hirsh (Central Institute for the Deaf) whose stimulating advice made this work possible; to Dr. Joseph Rosenstein, also of Central Institute for the Deaf; and to Dr. Alan Goodman of the Lester Hofheimer Audiology Laboratory, Department of Otolaryngology, Washington University School of Medicine, for their opportune help.

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APPENDIX.

Spanish Nonsense-Syllable Lists.

List 1	List 2	List 3	List 4
1. Ses	1. Erk	1. Sir	1. Ken
2. Ard	2. Mat	2. Yip	2. Sax
3. Nes	3. Sok	3. Nop	3. Dil
4. Lat	4. Nip	4. Sut	4. Neb
5. Sel	5. Urp	5. Ors	5. Kach
6. Arb	6. Sel	6. Net	6. Lib
7. Nem	7. Dap	7. Lek	7. Sok
8. Lad	8. Sun	8. Sep	8. Tex
9. Nef	9. Lab	9. Din	9. Naf
10. Sef	10. Ort	10. Kuf	10. Orx
11. Ark	11. Lep	11. Sem	11. Tet
12. Nel	12. Tok	12. Mill	12. Lad
13. Lon	13. Ers	13. Irk	13. Ers
14. Dac	14. Irk	14. Ter	14. Dot
15. Sap	15. Lod	15. Lau	15. Bal
16. Erb	16. Defi	16. Kok	16. Kot
17. Ner	17. Tot	17. Sek	17. Pek
18. Lol	18. Sab	18. Arf	18. Sast
19. Dil	19. Ned	19. Tif	19. Ilt
20. Sat	20. Tip	20. Sab	20. Ont
21. Ern	21. Saf	21. Lod	21. Gat
22. Nag	22. Nox	22. Fan	22. Sim
23. Dur	23. Dep	23. Nach	23. Erps
24. Tis	24. Pap	24. Erm	24. Lof
25. Sak	25. Sis	25. Dep	25. Sep
26. Tufi	26. Pep	26. Sach	26. Dal
27. Nas	27. Tad	27. Tad	27. Sis
28. Ert	28. Dis	28. Erx	28. Fun
29. Duk	29. Esp	29. Nat	29. Nof
30. Sod	30. Yal	30. Mol	30. Tafi
31. Til	31. Kel	31. Urk	31. Dus
32. Nol	32. Gos	32. Dor	32. Ert
33. Lel	33. Unt	33. Ton	33. Jep
34. Tok	34. Kas	34. Sefi	34. Fas
35. Soch	35. Elk	35. Dal	35. Eaf
36. Bat	36. Dof	36. Kop	36. Med
37. Kir	37. Sil	37. Nis	37. Dap
38. Guer	38. Arx	38. Kep	38. Bek
39. Kor	39. Nek	39. Lai	39. Nir
40. Pam	40. Bon	40. Jal	40. Olp
41. Mon	41. Lit	41. Pek	41. Yex
42. Yer	42. Tar	42. Sel	42. Arp
43. Kin	43. Mep	43. Pol	43. Usp
44. Sifi	44. Nok	44. Gar	44. Pall
45. Mir	45. Ball	45. Nafi	45. Mom
46. Bor	46. Jech	46. Bet	46. Kit
47. Fes	47. Alk	47. Dax	47. Dax
48. Pos	48. Ost	48. Lir	48. Arst
49. Kad	49. Kes	49. Bol	49. Tech
50. Jin	50. Fap	50. Non	50. Slip

THE M-R TEST OF BONE-CONDUCTION HEARING.*

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Obtaining a bone-conduction threshold free of contamination by the non-test ear is frequently beyond accomplishment by means of conventional BC audiometry. Even when the most elaborate formulas are followed to determine the appropriate level of masking noise, lateralization of the test signal to the non-test ear may persist—with or without the awareness of the person being tested. When it is possible to mask out the non-test ear, the level of noise required is sometimes distractingly loud. It may even cross over and partially mask the test ear. There is no need to elaborate on contralateralization of the test signal, cross-masking and related problems associated with BC audiometry, which have been well reviewed in the literature.^{1,2} Of interest here is an ingenious solution to these problems provided by the BC test of Rainville.^{3,4} I have derived from that test a simpler, quicker procedure which I call the modified Rainville or M-R test of BC hearing. It is the purpose of this paper to describe the M-R test and to enumerate its advantages and limitations.

Before describing the M-R test, it may be well to review briefly the original Rainville procedure. In addition to an AC audiometer capable of delivering pulses of tone, the following apparatus is required: a masking-noise generator, an amplifier and attenuator for controlling the noise level, a switch which allows the noise to be delivered either to a bone vibrator or—presumably through a mixing circuit—to the earphone of the audiometer. Two normative values, assuming that the audiometer is already calibrated, must be obtained before the Rainville test can be put to use: the normal threshold levels for the noise, AC and BC. Rainville's procedure

*From the Speech and Hearing Center, Department of Otolaryngology, University of Illinois College of Medicine. Technical contributions to the instrumentation described herein were made by Mr. M. P. Kesnar of the center mentioned above.

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication Jan. 9, 1960.

for testing a patient is as follows for each frequency: 1. determine the AC tone-pulse threshold; 2. mix the noise with the threshold-level AC tone and raise the noise level until the tone is no longer heard; 3. switch the noise to the BC vibrator, previously placed on the patient's head, and raise the noise level until the AC tone again disappears. The AC tone loss found in step 1 is subtracted from the AC noise level (in db relative to the normal threshold for AC noise) found in step 2. Subtracting this difference from the BC noise level (in db relative to the normal threshold for BC noise) reached in

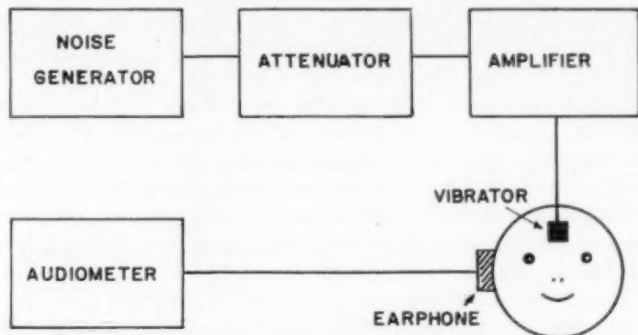


Fig. 1. Diagram of apparatus required for the M-R test.

step 3 above gives what Rainville interprets as the patient's absolute BC tone threshold for the frequency tested.

The primary advantage of the Rainville procedure is that it gives little opportunity for the non-test ear to interfere with measurement of the acuity of the ear under test. Moreover, the problem of cross-masking is eliminated.

THE M-R PROCEDURE.

The instrumental requirements for the M-R test, which are summarized graphically in Fig. 1, are similar to those of the Rainville test but are simpler because there is no need to combine the noise and tone. The noise channel is entirely separate from the tone channel. The noise generator may be any of

the several commercially available ones which provide a white noise. Saw-tooth noise generators, such as those used in most American-made audiometers, are not acceptable, for their line-hum harmonics are likely to create audible beats when transduced in the vicinity of the tone-delivering ear-phone. With some white-noise generators a pre-amplifier may have to be inserted in the circuit in front of the attenuator. In some situations a meter to monitor the output of the noise generator might be useful. Any stepped attenuator of the T type may be used providing it covers a range of 60 db or more; it is most convenient, however, if it is calibrated in 5-db steps. The amplifier need provide only a few watts and should have a 16-ohm or 8-ohm output tap. Although almost any commercial power amplifier would be satisfactory as far as the high-frequency end of its response characteristic might be concerned, it is of some importance to select one of uniform output down to 100 cps at the lower end. The bone vibrator may be of the ordinary hearing-aid type with which audiometers are usually furnished. With this type of vibrator the amplifier should be set to deliver about 4 volts (but not much more under ordinary circumstances) when attenuation is minimal.

As with any BC test, the M-R test requires obtaining normative data. This is relatively easy for only a few normally hearing persons with no history of ear pathology are needed; moreover, any reasonably quiet room will serve. In the case of each normal subject, you place the vibrator holder along the sagittal line so that the vibrator is held firmly on the center of the forehead. Then you set the headphone in its usual place and determine the AC threshold, which is defined here as the lowest level at which pulses of a tone presented at a rate of two per second can be heard without strain—not 50 per cent of the pulses but virtually all of them. Up to this point, although the noise generator should have been turned on, its output has been fully attenuated. Now, leaving the interrupted AC tone at threshold level, you decrease the attenuation of the BC noise until it just masks the AC tone. From the attenuator setting thus reached you deduce the setting which would be required if the ear's threshold were equal to

the norm specified by the National Bureau of Standards for the frequency concerned. Thus, if the obtained AC threshold were -10 db, and if the noise attenuator setting required to mask the tone at that level were 50 db, you would deduce that a noise 10 db greater, or an attenuator setting of 40, would be required to mask a threshold tone if the ear had conformed with the audiometric zero. For each frequency the median of several such deduced noise-attenuator settings will serve as the normative value required for the M-R test.

In M-R testing of a patient, the procedure is the same as that for getting the normative data. For each frequency you simply determine how much the BC noise must be attenuated to interfere with the perception of AC tone pulses at threshold. You then subtract the obtained attenuator reading from the normal value. The difference is the patient's BC hearing loss.

Let us consider a few examples involving a frequency for which we have learned that the noise attenuator must be set at 40 in order to provide just enough BC noise to mask a 0-db AC tone in the normal ear. Suppose we find that a patient has a 30-db AC loss. We leave the hearing-loss dial set at 30 and increase the level of the BC noise—i.e., we reduce its attenuation—by 5-db steps. Suppose that when the noise attenuator is at 40 db the patient no longer hears consistently the pulses of tone. Since the BC noise required to mask this patient is no greater than the normal amount, we learn that his BC loss is 0 ($= 40 - 40$); hence, the entire AC loss is conductive. Suppose that for another patient with a 30-db AC loss the noise attenuator reaches a setting of 25 before the AC tone is masked. We would then conclude that there is a BC loss of 15 ($= 40 - 25$) on which there is superimposed an additional 15-db conductive loss. Suppose that for a third patient with a 30-db AC loss the noise attenuator reaches a setting of 10 before the AC tone is masked. In this case the BC loss is equal to the AC loss, or 30 ($= 40 - 10$), which would imply that the entire loss is of a sensori-neural nature.

DISCUSSION.

The M-R test is based upon the assumption that the mask-

ing process in impaired ears is similar to that in normal ears. There is some reason to doubt that this assumption is completely valid.⁵ So far, however, in using the M-R test, I have not come across any pathological ears with masking characteristics abnormal enough to interfere seriously with the accuracy of the test.

Despite Rainville's interpretation of his test as one of absolute BC, I regard the M-R as a test of relative BC. This is not to say that the occlusion of the external canal by the AC earphone has no effect; rather, the effect on the threshold is the reverse of that which accompanies sinusoidal vibration of the skull by the test tone as in conventional BC testing. With occlusion in the latter, at least with respect to the lower frequencies, the AC tone created in the canal, presumably as a result of mandibular inertia and consequent deformation of the cartilaginous portion, is more intense and hence, reinforces the BC signal more than it would were there no occlusion; therefore, unless a conductive lesion is present to block the reinforcing AC tone, the BC threshold is lowered. Occlusion of the canal by the earphone in the M-R test results in reinforcement not of the tone but of the noise, unless there is a conductive impairment. The influence of such reinforcement in M-R testing of a normal ear or of one with only sensori-neural limitation is the same as that which prevailed during the procurement of the normative data; hence, in M-R testing of such ears no correction for occlusion need be made in the determination of the BC threshold. In M-R testing of a conductively impaired ear, however, the role of the AC noise created in the canal is negligible; hence, the BC vibrator has to be driven with greater intensity to effect masking than was required in establishing the norm. In other words the BC threshold obtained by means of the M-R test is somewhat higher than it should be when there is an appreciable conductive lesion, whether or not there is also sensori-neural loss. The amount of error in testing a conductively disturbed ear sometimes is as much as 10 db at 250 and 500 cps but is seldom more than 5 db at higher frequencies. The degree of conductive impairment does not appear to be critical as far as magnitude of the error is con-

cerned. Thus, the first two examples cited in the preceding paragraph are not quite accurate for test frequencies below 1000 cps. If the first example involved the test frequency of 500 cps, the hypothetical case with unmixed conductive loss would be more likely to yield an M-R threshold of 5 db than the zero amount previously stated.

The reliability of the M-R test may prove to be slightly lower than that of conventional BC audiometry because of the shape of the masking function. The reader will recall that when masking in db is plotted as a function of noise level, the curve rises elliptically at its foot and does not approach rectalinity until the noise level is high enough to effect several db of masking.⁶ That is, raising the noise level 5 db above the level required to shift the threshold of a tone by a fraction of a db will bring less than 5 db of additional shift. Day-to-day variability in M-R test results may be reduced if, in obtaining normative data as well as in testing patients, the AC tone is set at 5 db above threshold while the interfering noise level is obtained. When using an ordinary vibrator, I do not routinely follow this altered procedure because it lowers the maximum degree of sensori-neural loss which can be measured.

The maximal sensori-neural loss which can be measured by the M-R test, as by any other, varies as a function of frequency. At any single frequency the primary variable governing the maximum, other than gain of the amplifier, is the bone vibrator. With a maximum of 4 volts available some vibrators (I refer to ordinary hearing-aid types placed on the forehead) will allow measurement of a 60-db loss at 1000 cps; others will only handle a 40-db loss. The greatest losses measurable at 500, 2000 and 4000 cps are likely to be 5 or 10 db lower than at 1000 cps. It is difficult to find a vibrator, from ordinary sources, which will allow measurement of losses at 250 cps in excess of 15 or 20 db. Greater losses can be handled by increasing the maximum voltage; however, such action may produce non-linearity requiring application of corrections to the attenuator readings and may ultimately result in damage to the ordinary vibrator. Use of narrow-band filters would overcome these difficulties

but would add considerably to the complexity and expense of the equipment. To the practitioner who requires exact measurement of severe sensori-neural losses, I recommend procurement, from one of the several manufacturers of BC vibrators, of a unit especially constructed to transduce high inputs.

Several possible objections to the M-R procedure have been discussed. Let me now briefly enumerate the several conspicuous advantages of the M-R test: 1. lateralization to the non-test ear is not possible; 2. standardization can be accomplished easily on a few normal ears without an extraordinarily quiet room; 3. the test can be performed more quickly than can other procedures, including the conventional BC procedure as well as that described by Rainville; 4. either the poorer or the better ear can be tested first; 5. the perception required of the patient is a simple one; 6. no elaborate instructions to the patient are necessary; 7. instrumentation is not complicated.

After having used the M-R test on a large number and wide variety of hypacusic patients and having weighed its advantages against its limitations, I recommend it for clinical determination of BC auditory acuity.

SUMMARY.

A modification of Rainville's method of measuring BC threshold is described and called the M-R test. The M-R test consists in determining, for each test frequency, the lowest level of BC noise which interferes with the hearing by the ear under test of AC tone pulses at threshold. The difference between this noise level and the level of BC noise which has the same interfering effect on a normal ear is taken as the BC threshold of the ear under test. Possible difficulties in the administration and interpretation of the M-R test are discussed, and its particular merits are mentioned. It is concluded that the several advantages of the M-R test warrant its recommendation.

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ANNUAL SPRING MEETING OF THE NEW YORK EYE AND EAR INFIRMARY ALUMNI.

The Annual Spring Meeting of the Alumni Association of the New York Eye and Ear Infirmary will take place April 17-19, 1961.

Symposia will be offered on Otosclerosis and Benign Lesions of the Larynx. There will also be a Closed Circuit Television demonstration of surgical procedures. In addition there will be lectures on Plastic Surgery, Paranasal Sinuses and Carcinoma of the Head, Neck and Larynx.

For further information write Dr. John R. Finlay, Secretary, Alumni Association, 218 Second Avenue, New York 3, N. Y.

CORRECTION.

In the October, 1960, issue, page 1451, the last paragraph states that the Michelson drill is manufactured by Storz Instrument Co. of St. Louis. This should read "This drill is distributed by Storz Instrument Co., St. Louis, Mo."

DIFFERENCES IN DIFFICULTY AMONG THE CID W-22 AUDITORY TESTS.

BARRY S. ELPERN, Ph.D.,

Chicago, Ill.

The importance of auditory speech-discrimination tests in the assessment of hearing dysfunction is attested by the great amount of clinical and experimental work which has involved such tests. The most widely used discrimination measure, at present, is the W-22 Auditory Test series developed by Hirsh and his associates³ at Central Institute for the Deaf. This series, recorded on 12-inch unbreakable discs, comprises four, 50-word lists, each of which is recorded in six different word orders, designated A, B, C, D, E, and F. The clinical popularity of W-22 is undoubtedly attributable to the fact that the discs are commercially available and offer a simple, more-or-less standardized form of presentation.

Through preliminary trials, Hirsh sought to determine whether differences in difficulty existed among the four main lists. He examined three groups of five normal-hearing subjects and, on the basis of articulation functions yielded by these groups concluded (p. 333³):

These data show no consistent differences between scores on the four different lists. All listeners were given ample opportunity to study alphabetical lists of the words, however, and heard scramblings of each list at least three times. In a shorter clinical procedure where listeners may hear scramblings of two different lists once, some sort of differences between lists may appear from listener to listener. It can only be said that the averaged data of several listeners from several tests showed no consistent difference between lists—these results await verification from several clinics using a large number of listeners.

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication April 1, 1960.

To the writer's knowledge, such verification has not materialized, at least, not in the form of a published report.

On the basis of the initial trials, the four test lists are assumed to be, and are employed as though they are, equal in difficulty; therefore, it seems worthwhile to examine this assumption using a much larger group of subjects in order to provide broader evidence for or against the prevailing indiscriminate intercomparison of scores obtained by means of these tests.

TABLE I.

Distribution of Monaural Discrimination Test Scores.

VA Audiology Clinic	List 1	List 2	List 3	List 4
Washington	32	26	21	21
Chicago	146	150	217	212
New York	81	76	7	10
Los Angeles	42	51	29	26
San Francisco	24	52	55	42
Dallas	73	70	16	11
List Totals	398	425	345	322
Grand Total—1,490.				

PROCEDURE.

A pool of 1,490 monaural discrimination scores was accumulated with the assistance of the clinical staffs of VA Audiology Clinics in Chicago, New York, Washington, Dallas, San Francisco, and Los Angeles. All measurements were obtained through the use of recorded W-22 50-word lists; however, scores yielded by patients in any way suspected of having a non-organic hearing loss component were disregarded. The raw data for each ear were simply the specific list used, *e.g.*, 2-F, and the number of words *misunderstood*. The number missed was then converted to percentage of discrimination loss by multiplying by a factor of 2.

The test ears were distributed in random fashion among four groups; one for each of the four W-22 lists. Any difference found between two groups was assumed to be analogous to a difference between the lists to which these groups

were exposed. The distribution of monaural tests by VA Clinic and by W-22 list is shown in Table I. In view of the numerical size of the groups and the geographical dispersion of the measurements, it was felt that potentially pertinent factors, such as age and hearing loss types, would tend to be inter-equated.

Raw data were analyzed by applying "F" and "t" tests to the difference between variances and means, respectively, of each of the six possible pairs of groups: 1 and 2, 1 and 3, 1 and 4, 2 and 3, 2 and 4, and 3 and 4. Pairs whose variances

TABLE II.
Basic Statistical Data for the Four Groups Employed in This Study.

Group (List)	N	Mean Discrimination Loss (M)	SE of M	Variance	Standard Deviation (s)	SE of s
1	398	13.62%	$\pm .700$	194.379	13.942%	$\pm .494$
2	425	15.64%	$\pm .836$	296.322	17.214%	$\pm .590$
3	345	16.97%	$\pm .979$	329.931	18.164%	$\pm .691$
4	322	18.30%	± 1.033	342.546	18.508%	$\pm .729$

differed significantly were evaluated with respect to the difference between their means by applying the Cochran and Cox¹ approximation reviewed in Edwards² (p. 274). The primary consideration, for the purposes of this study, was the evaluation of differences between means of each of the several pairs of groups. For any given pair, a significant difference between means was interpreted as a significant difference in average difficulty, with the greater mean representing the more difficult of the two lists under comparison.

RESULTS AND DISCUSSION.

Basic statistics derived from the raw data appear in Table II. Inspection of this Table reveals two things of primary interest: *a.* the widest difference between means is less than five per cent, and *b.* the widest difference between standard

deviations is also less than five per cent. Insofar as the means and standard deviations are indices of average *level* of difficulty and average *range* of difficulty, respectively, the observed maximum disparities appear to be well within the limits of tolerance acceptable in clinical procedures; therefore, visual evaluation of the data seems to warrant the conclusion that the differences noted are, from a practical standpoint, non-significant, and that they may be disregarded in clinical practice. It is, in other words, difficult to visualize a situation in which differences such as those mentioned would critically influence a clinical decision.

TABLE III.

Statistical Evaluation of the Difference Between Variances (s^2) for All Pair Combinations of Four Experimental Groups.

The F value is the ratio of the greater variance to the lesser, and the entry in column P indicates the probability of occurrence of an F ratio as large as that obtained.

Pair of Groups (Lists)	Greater s^2	Lesser s^2	F	df	P
1 and 2.....	296.322	194.379	1.524	424/397	<.02†
1 and 3.....	329.931	194.379	1.697	344/397	<.02†
1 and 4.....	342.546	194.376	1.762	321/397	<.02†
2 and 3.....	329.931	296.322	1.113	344/424	>.10*
2 and 4.....	342.546	296.322	1.156	321/424	>.10*
3 and 4.....	342.546	329.931	1.038	321/344	>.10*

*Not significant.

†Significant.

It is not unlikely, however, that in certain research applications, inter-list differences would be intolerable; therefore, to determine the suitability of the lists to the relatively rigorous standards adopted for research purposes, the differences between means and variances of the several pairs of lists were statistically evaluated. Five per cent (.05) was adopted as the cutoff probability value (P). This is to say that the difference between any pair of means or variances associated with a P less than five per cent (<.05) was considered significant; a difference associated with a P greater than five per cent (>.05) was considered not significant. A summary of the evaluation of differences between variances appears in Table III.

Significant variance ratios (F) occur only for pairs of lists of which one member is List 1. It has already been shown in Table II that the variance associated with List 1 is smaller than those of the remaining three lists; therefore, the range of difficulty of List 1, indicated by its variance, is significantly smaller, or more restricted than that of any of the other lists, which, among themselves, are relatively equal in range of difficulty.

The evaluation of differences between means is summarized in Table IV. Just as a significant difference between vari-

TABLE IV.

Statistical Evaluation of the Difference Between Means for All Pair Combinations of Four Experimental Groups.

The *t* value is the ratio of the arithmetical difference between means to the standard error of this difference, and the entry in column *P* indicates the probability of occurrence of a *t* ratio as large as that obtained.

Pair of Groups (Lists)	Difference Between Means	SE of Diff.	<i>t</i>	<i>P</i>
1 and 2.....	2.02%	1.089	1.855	>.05*
1 and 3.....	3.35%	1.202	2.787	<.01†
1 and 4.....	4.68%	1.246	3.751	<.01†
2 and 3.....	1.33%	1.286	1.036	>.05*
2 and 4.....	2.66%	1.328	2.003	<.05†
3 and 4.....	1.33%	1.421	.931	>.05*

*Not significant.

†Significant.

ances, denoted by the *F* value, indicates a systematic difference in range of difficulty, a significant difference between means, denoted by the value of *t*, indicates a systematic difference in average level of difficulty. On the basis of *t* scores reported in Table IV, it is concluded that Lists 1 and 2, 2 and 3, and 3 and 4 are relatively equal in average level of difficulty, but that Lists 1 and 3, 1 and 4, and 2 and 4 are significantly different in this respect.

SUMMARY.

The foregoing analysis has illustrated the existence of systematic differences both in average level of difficulty and in average range of difficulty, among the four W-22 word lists. It was the writer's opinion that the magnitude of the

observed differences is such that they may be disregarded in clinical practice; however, in view of the fact that these differences are, nonetheless, sources of systematic bias, it became necessary to evaluate them with regard to experimental requirements. The evaluation of the differences between means and variances for all possible pairs of lists indicates that the only pairs which do not differ in either respect are Lists 2 and 3, and Lists 3 and 4. These pairs of lists, then, may be employed as speech stimuli in laboratory studies without introducing bias resulting from differences in difficulty.

The writer acknowledges the helpful criticism of Dr. James Jerger, Northwestern University, and the co-operation of the chiefs and audiological staffs of the VA audiology clinics mentioned in the text.

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820 South Damen Avenue.

THE MOUNT SINAI HOSPITAL POSTGRADUATE COURSE.

In order not to conflict with the International Congress of Otolaryngology to take place in Paris in July, 1961, the annual intensive postgraduate course in Rhinoplasty, Reconstructive Surgery of the Nasal Septum and Otoplasty will be given January 7-20, 1961, by Dr. Irving B. Goldman and staff at the Mount Sinai Hospital, New York, in affiliation with Columbia University.

Candidates for the course should apply to Registrar for Postgraduate Medical Instruction, The Mount Sinai Hospital, Fifth Avenue and 100th Street, New York 29, N. Y.

AIR DRIVEN HAND PIECE FOR TEMPORAL BONE SURGERY.*

ROBIN P. MICHELSON, M.D.,
Redwood City, Calif.

The instrument is an air operated hand piece which has many advantages over the conventional electric engine belt driven hand piece presently in use. Among the many advantages are the fact that this is an extremely flexible instrument and can be driven at extremely high speeds or very low speeds and is controlled with the finger tip rather than with the foot. It is also extremely flexible in that there are no arms or other attachments to the hand piece except a small flexible plastic hose which supplies the air to the hand piece. The air driven hand piece develops considerably greater torque and speed than any available motor drive. It is almost vibrationless, is quiet and runs cool.

The instrument consists basically of a small turbine into which can be plugged either a straight or an angled drive hand piece. The burrs which screw into the ends of the hand pieces are interchangeable. There is also a control box through which the air passes. This consists of a small filter that takes out small particles of dust and water in the air, a pressure reduction valve and a pressure gauge. By setting the air pressure to the hand piece the pressure reduction valve can control its maximum speed for any given depression of the trigger on the side of the hand piece. The trigger on the side of the hand piece not only stops and starts the turbine, but also controls its speed.

At 60 pounds of static air pressure the turbine itself will develop 175,000 revolutions per minute free running, and since it is fitted with a small reduction device, the spindle speed is around 60,000 revolutions per minute at this pressure.

*From the Department of Otolaryngology, Stanford University School of Medicine, Palo Alto, Calif.

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication April 6, 1960.



Fig. 1. Straight hand piece, angle hand piece, turbine and assorted burs.

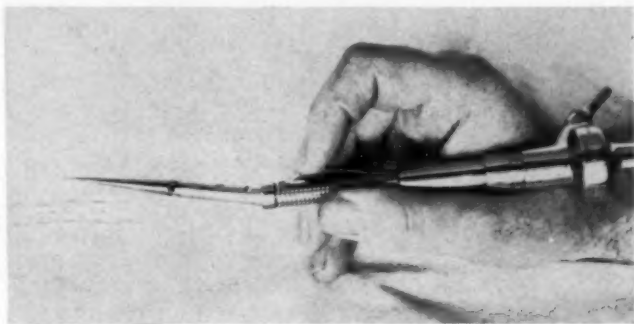


Fig. 2. The angle drive plugged into the turbine with a $\frac{1}{2}$ mm. diamond stone.

This can be continuously varied to 200 or 300 revolutions per minute.

The burs are mounted in tapered bushings, and the support of these bushings is carried as close to a cutting head of the burr as is possible. The large cutting burs are supported clear out to the head. On some of the smaller ones, it has been necessary to allow the shaft to extend for some distance beyond the end of the bushing. The burs' shafts automatically engage the spindle shaft with a positive locking device

when the burrs are screwed into the end of the hand piece. This eliminates not only a tendency for the burrs to run eccentrically, but also eliminates the slip of the conventional collet clutch used in other types of hand pieces.

The instrument is sterilized either in a hot oil bath or in dry air. Steam sterilization and water sterilization are to be avoided since the delicate, extremely fine surfaces of the ball



Fig. 3. Straight hand piece plugged into the turbine with Jordan Day cutting burr. (Note the index finger on the turbine throttle.)

bearings upon which the shaft and rotor turn can be easily damaged or etched by moisture and would lose their close tolerances.

In use the author has found that the high speed is very useful with the Jordan-Day cutting burr, and that one uses very little pressure against this burr to accomplish a great deal in exenterating mastoid cavity. For finer delicate cutting, one can use lower speeds and a smaller finely tapered burr; thus, it is possible to thin out the footplate of the stapes with the half millimeter diamond burr just barely turning over.

A question was raised during the development of this instrument regarding the sterility of the exhausted air and the possibility that the air exhausts might be a possible source of contamination. Accordingly, the air from the exhaust was

blown against a blood agar plate for a period of 10 minutes, this representing about 40 cubic feet of air. No growth occurred on two consecutive tests. This would seem to allay this fear of a possible source of contamination.

39 Birch Street.

POSTGRADUATE COURSE IN ALLERGY.

A continuous course of two weeks' duration is being offered by the Departments of Allergy and Applied Immunology of the Temple University Medical Center and the Graduate School of Medicine of the University of Pennsylvania. Sessions will be held daily at the Temple University Medical Center from 9:00 A.M. to 5:00 P.M. from February 2 to March 10, 1961. Tuition fee—\$175.00. Enrollment limited. Dr. Louis Tuft is course director with Drs. George Blumstein and Merle M. Miller as associate directors.

An outstanding faculty has been assembled to review the basic principles of immunology and allergy as applied to clinical practice. Emphasis will be given to the methods of diagnosis and management of the allergic patient.

The course is designed for physicians desirous of extending their knowledge of allergy. It could serve as an introductory course for those about to enter the field or as a review course for practicing allergists.

For brochure and application forms write to: Dr. George Blumstein, c/o Temple Medical Center, Philadelphia 40, Pa.

AN HOUR-GLASS ANTERIOR COMMISSURE LARYNGOSCOPE.*

PAUL H. HOLINGER, M.D.,
Chicago, Ill.

The design of this instrument incorporates a significant modification of a previously described anterior commissure laryngoscope. Accentuating the principle of the Yankauer post-nasal speculum, the proximal and distal portions of the



scope are flared, while the center is markedly constricted. The narrow center section is measured to be at the point of greatest contact with both upper and lower teeth when the laryngoscope is in the position of optimum laryngeal exposure. The view of the anterior commissure is obtained with a minimum

*From the Department of Otolaryngology of the University of Illinois College of Medicine.

Editor's Note: This manuscript received in The Laryngoscope Office and accepted for publication Oct. 6, 1960.

of anterior lift necessary to elevate the epiglottis. The small infant lights and the light carriers are used to reduce further the external diameter. Single or double illumination instruments are available, although the single carrier is preferred except for the edentulous patient. The instrument is manufactured by the George P. Pilling and Son Co. of Philadelphia.

UNIVERSITY OF TORONTO—POSTGRADUATE COURSE IN OTOLARYNGOLOGY.

On May 11, 12 and 13, 1961, there will be presented a graduate course in this specialty by the staff of the Department of Otolaryngology, assisted by two distinguished guests: Dr. Philip E. Meltzer, Interim Chief of Otolaryngology, Massachusetts Eye and Ear Infirmary, and Acting Head of the Department of Otolaryngology, Harvard Medical School; and Dr. W. G. Hemenway, Department of Otolaryngology, University of Chicago.

The first session will begin in the afternoon of May 11th, in the Royal York Hotel, Toronto, in conjunction with the Section of Otolaryngology of the Ontario Medical Association. The remainder of the sessions will be held in the clinical areas of the University of Toronto.

An attempt will be made to assess, discuss and demonstrate the newer procedures employed in the surgery of deafness. The present surgical treatment of head and neck problems will be presented with special consideration of the new conceptions of the responsibilities of our specialty in their management.

The fee for the course will be \$40.00 and will include a complimentary dinner.

Please address all inquiries to the Director, Division of Postgraduate Medical Education, University of Toronto.

**DALLAS ACADEMY OF OPHTHALMOLOGY
AND OTOLARYNGOLOGY.**

PROGRAM 1960-1961.

December 6, 1960.

Parkland Memorial Hospital, Rooms No. 101-102.

5:30 P.M.—Otolaryngology Clinical Conference.

**7:30 P.M.—“Surgery of the Vitreous”—Retinal Detachments,
Pupillary Block, etc.—Dr. Donald M. Shafer, New
York, N. Y.**

January 10, 1961.

Parkland Memorial Hospital, Rooms No. 101-102.

5:30 P.M.—Clinical Ophthalmology Conference.

**5:30 P.M.—Dr. William C. Huffman, Iowa City, Ia.—Subject:
“General Problems in Re-Constructive Surgery
about the Head and Neck.”**

**7:30 P.M.—Dr. William C. Huffman—Subject: “Facial Lac-
erations.”**

February 7, 1961.

Parkland Memorial Hospital, Rooms No. 101-102.

**5:30 P.M.—Clinical Otolaryngology and Ophthalmology Con-
ference.**

7:30 P.M.—Dr. Robert N. Shaffer, San Francisco, Calif.

(1) “Congenital Glaucomas.”

**(2) Use of Operating Microscope in Ocular Sur-
gery.**

March 20-22, 1961.

Dallas Southern Clinical Society, Statler Hilton Hotel.

**Guests: Dr. Ramon Castroviejo, New York, N. Y.
(Ophthalmology)**

- Dr. Philip Knapp, New York, N. Y. (Ophthalmology)
Dr. French K. Hansel, St. Louis, Mo.
(Otolaryngology)
Dr. John J. Shea, Memphis, Tenn. (Otolaryngology)

April 4, 1961.

Parkland Memorial Hospital, Rooms No. 101-102.

- 5:30 P.M.—Clinical Otolaryngology and Ophthalmology Conference.
7:30 P.M.—Otolaryngology. Panel: "Hearing in Relation to Speech Formation and School Performance"—Dr. Edward Pratt, Moderator; Dr. Phillip Hood, Dr. Jack Martin, and Dr. Martha Helen Hale.
7:30 P.M.—Ophthalmology. "Pre-orbital and Adnexal Ocular Lesions with Basic Principles of Plastic Reconstructive Surgery." Panel: Dr. Billie L. Arnoff, Surgeon; Dr. Donald A. Corgill, Otolaryngologist; Dr. William C. Sellman, Plastic Surgeon; Dr. Coleman Jacobson, Dermatologist.

May 2, 1961.

Parkland Memorial Hospital, Rooms No. 101-102.

- 5:30 P.M.—Clinical Otolaryngology and Ophthalmology Conference.
7:30 P.M.—Otolaryngology: Dr. William Wright, Houston, Tex. Subject: "Improved Methods of Handling Bony Deviations of the Nasal Septum." Discussion: Dr. Marvin G. Shepard, Dallas, Tex.
7:30 P.M.—Ophthalmology: "Non-Surgical Considerations in Horizontal Ocular Deviations." Dr. John Lippas, Parkland Memorial Hospital.

June 6, 1961.

Parkland Memorial Hospital, Rooms No. 101-102.

- 5:30 P.M.—Clinical Otolaryngology and Ophthalmology Conference.

7:30 P.M.—Otolaryngology: Papers presented by Residents of our Teaching Hospitals. Dr. Ben Stegal—"Pseudomonas Infections in Otolaryngology." Dr. Sam Huggins—"Experience in Rhinoplasty Procedures." Dr. Chris Helmus—"Aortic Hemograft Reconstruction in Radical Hypopharyngeal Surgery."

7:30 P.M.—Ophthalmology: "Ocular Problems Related to Space Medicine." Speaker to be announced.

VIIeme INTERNATIONAL CONGRESS OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY.

The Seventh International Congress of Otolaryngology, Rhinology and Laryngology will be held in Paris, July 23-29, 1961, at the New Faculte of Medicine, Rue des Saints-Peres. The program includes 1. The Recent Acquisitions, Pathology and Therapeutics of Otosclerosis by Profs. Sourdille, Sercey and Krmpotic, Weber, Ardouin, Larroude, Ferreri and Shambaugh. 2. Indications and Five-Year Results in Surgery and Radium in the Treatment of Cancers of the Larynx and Hypopharynx—Profs. Pietrantonio and Agazzi Alonzo, Casadesus, C. L. Jackson, Leicher, Leroux-Robert and Ormerod. 3. A Report on Allergy and Infections of the Nose and Bronchus—Profs. Van Dishoeck, Clerici, Hlavacek, Voohorst, Mayer, Laskiewicz and Terracol.

Tours and entertainment for guests and their ladies have been arranged. President: Dr. Maurice Aubry; Secretary General: Henry Guillon. For further details write Dr. Guillon, 6 Avenue McMahon, Paris, France.

DIRECTORY OF OTOLARYNGOLOGIC SOCIETIES.

(Secretaries of the various societies are requested to keep this information up to date).

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

President: Dr. Erling W. Hansen, 90 So. Ninth St., Minneapolis, Minn.
Executive Secretary: Dr. William L. Benedict, Mayo Clinic, Rochester,
Minn.

Meeting: Palmer House, Chicago, Ill., October, 1961.

AMERICAN ASSOCIATION FOR CLEFT PALATE REHABILITATION.

President: Dr. J. J. Longacre, 1503 Carew Tower, Cincinnati, O.
President-Elect: Dr. D. C. Samuel Pruzansky, D.D.S., 840 So. Wood St.,
Chicago, Ill.

Secretary-Treasurer: Dr. Spriestersbach, Ph.D., Department of Otolaryngology, University Hospital, Iowa City, Ia.

Meeting:

AMERICAN BOARD OF OTOLARYNGOLOGY.

President: Dr. Gordon D. Hoople, 1100 E. Genesee Dr., Syracuse 10, N. Y.

Secretary: Dr. Dean M. Lierle, University Hospital, Iowa City, Ia.

Meeting: Palmer House, Chicago, Ill., October, 1961.

AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION.

President: Dr. F. Johnson Putney, 1712 Locust St., Philadelphia 3, Pa.
Vice-President: Dr. Julius W. McCall, 619 Rose Bldg., 2060 E. 9th St.,
Cleveland 15, O.

Secretary: Dr. Daniel C. Baker, Jr., 903 Park Ave., New York 21, N. Y.

Treasurer: Dr. Charles M. Norris, 3401 No. Broad St., Philadelphia 40,
Pa.

Meeting: Lake Placid Club, Lake Placid, N. Y., May 23-24, 1961 (after-
noons only).

AMERICAN LARYNGOLOGICAL ASSOCIATION.

President: Dr. Edwin N. Broyles, Baltimore, Md.

Secretary: Dr. Lyman G. Richards, Wellesley Hills, Mass.

Treasurer: Dr. Francis E. LeJeune, New Orleans, La.

Editor, Historian, and Librarian: Dr. Francis W. Davison, Danville, Pa.

Meeting: Lake Placid Club, Essex Co., N. Y., May 21-22, 1961.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

President: Dr. Fletcher D. Woodward, 400 Locust Ave., Charlottesville,
Va.

President-Elect: Dr. John R. Lindsay, Chicago, Ill.

Secretary: Dr. C. Stewart Nash, 700 Medical Arts Bldg., Rochester 7,
N. Y.

Treasurer: Dr. K. M. Day, 121 University Pl., Pittsburgh, Pa.

Annual Meeting: Lake Placid Club, Essex Co., N. Y., May 23-24-25, 1961.

**AMERICAN MEDICAL ASSOCIATION,
SECTION ON LARYNGOLOGY, OTOTOLOGY AND RHINOLOGY.**

Chairman: Dr. Lawrence R. Boies, Minneapolis, Minn.
Vice-Chairman: Dr. Howard P. House, Los Angeles, Calif.
Secretary: Dr. Walter E. Heck, San Francisco, Calif.
Delegate: Dr. Gordon F. Harkness, Davenport, Ia.
Alternate Delegate: Dr. Paul H. Hollinger, Chicago, Ill.
Representative to Scientific Exhibit: Dr. Walter H. Maloney, Cleveland, O.
Meeting: New York City, June 26-30, 1961.

AMERICAN OTOLOGICAL SOCIETY, INC.

President: Dr. Henry L. Williams, Rochester, Minn.
Vice-President: Dr. Lawrence R. Boies.
Secretary-Treasurer: Dr. James A. Moore, New York City, N. Y.
Annual Meeting: Lake Placid Club, Essex Co., N. Y., May 26-27, 1961.

**AMERICAN OTORHINOLOGIC SOCIETY FOR THE ADVANCEMENT
OF PLASTIC AND RECONSTRUCTIVE SURGERY.**

President: Dr. Joseph Gilbert, 111 E. 61st St., New York, N. Y.
Vice-President: Dr. Kenneth Hinderer, 402 Medical Arts Bldg., Pittsburgh, Pa.
Secretary: Dr. Louis Joel Feit, 66 Park Ave., New York 16, N. Y.
Treasurer: Dr. Arnold L. Caron, 36 Pleasant St., Worcester, Mass.

AMERICAN RHINOLOGIC SOCIETY.

President: Dr. Ivan W. Philpott, 1801 High St., Denver, Colo.
Secretary: Dr. Robert M. Hansen, 2210 Lloyd Center, Portland 12, Ore.
Annual Clinical Session: Chicago, Ill., October, 1961 (definite time and place to be announced later).
Annual Meeting: Chicago, Ill., October, 1961 (definite time and place to be announced later).

AMERICAN SOCIETY FOR HEAD AND NECK SURGERY.

President: Dr. John J. Conley, New York, N. Y.
Vice-President: Dr. Joseph H. Ogura, St. Louis, Mo.
Treasurer: Dr. F. Johnson Putney, Philadelphia, Pa.
Secretary: Dr. George A. Sisson, Syracuse, N. Y.
Annual Meeting: Palmer House, Chicago, Ill.

AMERICAN SOCIETY OF FACIAL PLASTIC SURGERY.

President: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis, Tenn.
Vice-President: Dr. John T. Dickinson, Mercy Hospital, Pittsburgh 19, Pa.
Secretary: Dr. Samuel M. Bloom, 123 East 83rd St., New York 28, N. Y.
Treasurer: Dr. Joseph C. Miceli, 879 Glenmore Ave., Brooklyn, N. Y.
Winter Meeting: February 9-10, 1961, Peabody Hotel, Memphis, Tenn.

**AMERICAN SOCIETY OF OPHTHALMOLOGIC AND
OTOLARYNGOLOGIC ALLERGY.**

President: Dr. Leland H. Prewitt, Ottumwa, Ia.
Secretary-Treasurer: Dr. Daniel S. DeStio, 121 S. Highland Ave., Pittsburgh 6, Pa.
Annual Meeting: Palmer House, Chicago, Ill., October 7, 1961.

**ASSOCIACAO MEDICA DO INSTITUTO PENIDO BURNIER—
CAMPINAS.**

President: Dr. Alberto Gallo.
First Secretary: Dr. Alfredo Martinelli.
Second Secretary: Dr. Guedes de Melo Neto.
Librarian-Treasurer: Dr. L. de Souza Queiroz.
Editors for the Archives of the Society: Dr. Antonio de Almeida, Dr. Gabriel Pôrto, and Dr. Roberto Franco do Amaral.

**ASOCIACION DE OTORRINOLARINGOLOGIA
Y BRONCOESOFAGOLOGIA DE GUATEMALA.**

Presidente: Dr. Julio Quevedo, 15 Calle Oriente No. 5.
First Vice-Presidente: Dr. Héctor Cruz, 3a Avenida Sur No. 72.
Second Vice-Presidente: Dr. José Luis Escamilla, 5a Calle Poniente No. 48.
Secretario-Tesorero: Dr. Horace Polanco, 13 Calle Poniente No. 9-D.

ASOCIACION DE OTO-RINO-LARINGOLOGIA DE BARCELONA, SPAIN.

Presidente: Dr. J. Abello.
Vice-Presidente: Dr. Luis Suñe Medan.
Secretario: Dr. Jorge Perelló, 319 Provenza, Barcelona.
Vice-Secretario: Dr. A. Pinart.
Vocal: Dr. J. M. Ferrando.

BALTIMORE NOSE AND THROAT SOCIETY.

Chairman: Dr. Walter E. Loch, 1039 No. Calvert St., Baltimore, Md.
Secretary-Treasurer: Dr. Theodore A. Schwartz.

BUENOS AIRES CLUB OTOLARINGOLOGICO.

Presidente: Dr. K. Segre.
Vice-Presidente: Dr. A. P. Belou.
Secretario: Dr. S. A. Aranz.
Pro-Secretario: Dr. J. M. Tato.
Tesorero: Dr. F. Games.
Pro-Tesorero: Dr. J. A. Bello.

**CANADIAN OTOLARYNGOLOGICAL SOCIETY
SOCIETE CANADIENNE D'OTOLARYNGOLOGIE.**

President: Dr. Fernand Montreuil, 1123 St. Joseph Blvd. East, Montreal, Quebec.
Secretary: Dr. Donald M. MacRae, 324 Spring Garden Road, Halifax, Nova Scotia.
Meeting: Queen Elizabeth Hotel, June 15-17, 1961.

**CENTRAL ILLINOIS SOCIETY OF OPHTHALMOLOGY
AND OTOLARYNGOLOGY.**

President: Dr. G. E. Hartenbower, 203 N. Main St., Bloomington, Ill.
President-Elect: Dr. Edgar T. Blair, Springfield, Ill.
Vice-President: Dr. G. LeRoy Porter, Urbana, Ill.
Delegate at Large: Dr. S. G. Baldwin, Danville, Ill.
Secretary-Treasurer: Dr. C. L. Pannabecker, Peoria, Ill.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

President: Dr. George Woodruff, Woodruff Clinic, Joliet, Ill.
 Vice-President: Dr. Linden Wallner, 122 So. Michigan, Chicago, Ill.
 Secretary-Treasurer: Dr. Robert Lowy, 25 East Washington St., Chicago 2, Ill.
 Meeting: First Monday of each month, October through May.

CHILEAN SOCIETY OF OTOLARYNGOLOGY.

President: Dr. Enrique Grünwald S.
 Vice-President: Dr. Agustín Estartus.
 Secretary: Dr. Marcos Chaimovich S.
 Treasurer: Dr. Benjamin Kaplan K.
 Director: Dr. Alberto Basterrica A.

COLORADO OTOLARYNGOLOGY SOCIETY.

President: Dr. James T. Blair, Denver, Colo.
 Vice-President: Dr. James Rigg, Grand Junction, Colo.
 Secretary: Dr. Will P. Pirkey, Denver, Colo.

COLUMBUS, OHIO, OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY.

President: Dr. John E. Arthur.
 Secretary: Dr. M. L. Battles.
 Meetings: First Monday of October through May, University Club, Columbus, O.

DALLAS ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

President: Dr. Edward A. Newell.
 Vice-President: Dr. Thomas M. McCrory.
 Secretary-Treasurer: Dr. James L. Baldwin, 1627 Medical Arts Bldg., Dallas, Tex.

FEDERACION ARGENTINA, DE SOCIEDADES DE OTORRINOLARINGOLOGIA.

Secretary of the Interior: Prof. Dr. Atilio Viale del Carril.
 Secretary of the Exterior: Dr. Aldo G. Remorino.
 Secretary Treasury: Prof. Dr. Antonio Carrascosa.
 Pro-Secretary of the Interior: Prof. Dr. Carlos P. Mercandino.
 Pro-Secretary of the Exterior: Prof. Dr. James A. del Sel.
 Pro-Secretary of the Treasury: Dr. Jorge Zubizarreta.

FIRST CENTRAL AMERICAN CONGRESS OF OTORHINOLARYNGOLOGY.

President: Dr. Victor M. Noubleau, San Salvador.
 Secretary-Treasurer: Dr. Hector R. Silva, Calle Arce No. 34, San Salvador, El Salvador, Central America.

FLORIDA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

President: Dr. G. Dekle Taylor, Jacksonville, Fla.
 President-Elect: Dr. Kenneth S. Whitmer, Miami, Fla.
 First Vice-President: Dr. William H. Anderson, Jr., Ocala, Fla.
 Second Vice-President: Dr. Marion W. Hester, Lakeland, Fla.
 Secretary-Treasurer: Dr. Joseph W. Taylor, Jr., 1 Davis Blvd., Tampa 6, Fla.

**FOURTH LATIN-AMERICAN CONGRESS OF
OTORINOLARINGOLOGIA.**

President: Dr. Dario.
Secretary:
Meeting:

FORT WORTH EYE, EAR, NOSE AND THROAT SOCIETY.

President: Dr. Van D. Rathgeber.
Vice-President: Dr. William Skokan.
Secretary-Treasurer: Dr. Paul Rockwell.

GEORGIA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

President: Dr. P. W. Rhyne, Albany, Ga.
Vice-President: Dr. C. L. Pennington, Macon, Ga.
Secretary: Dr. James T. King, 516 Baptist Professional Bldg., Atlanta 12, Ga.
Meeting: Oglethorpe Hotel, Wilmington Island, Savannah, Ga., March 2-4, 1961.

GREATER MIAMI EYE, EAR, NOSE AND THROAT SOCIETY.

President: Dr. Mariano C. Caballero.
Vice-President: Dr. Joseph Freeman.
Secretary-Treasurer: Dr. H. Carlton Howard.
Meeting: Quarterly in March, May, October and December on the second Thursday of the month, 6:30 P.M., at the McAllister Hotel, Miami, Fla.

INTERNATIONAL BRONCHESOPHAGOLOGICAL SOCIETY.

President: Dr. Jo Ono, Tokyo, Japan.
Secretary: Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia 40, Pa., U. S. A.
Meeting:

**KANSAS CITY SOCIETY OF OTOLARYNGOLOGY
AND OPHTHALMOLOGY.**

President: Dr. Clarence H. Steele.
President-Elect: Dr. Dick H. Underwood.
Secretary: Dr. James T. Robison, 4620 J. C. Nichols Parkway, Kansas City, Mo.
Meeting: Third Thursday of November, January, February and April.

**LOS ANGELES SOCIETY OF OPHTHALMOLOGY
AND OTOLARYNGOLOGY.**

President: Dr. Max E. Pohlman.
Secretary-Treasurer: Dr. Wendell C. Irvine.
Chairman of Ophthalmology Section: Dr. Carroll A. McCoy.
Secretary of Ophthalmology Section: Dr. Philip D. Shanedding.
Chairman of Otolaryngology Section: Dr. Robert W. Godwin.
Secretary of Otolaryngology Section: Dr. Francis O'N. Morris.
Place: Los Angeles County Medical Association Bldg., 1925 Wilshire Blvd., Los Angeles, Calif.
Time: 6:30 P.M. last Monday of each month from September to June, inclusive—Otolaryngology Section. 6:30, first Thursday of each month from September to June, inclusive—Ophthalmology Section.

**LOUISIANA-MISSISSIPPI OPHTHALMOLOGICAL
AND OTOLARYNGOLOGICAL SOCIETY.**

President: Dr. Arthur V. Hays.
Secretary: Dr. Edley H. Jones, 1301 Washington St., Vicksburg, Miss.
Meeting: Edgewater Gulf Hotel, Edgewater Park, Miss., May 12-13, 1961.

**MEMPHIS SOCIETY OF OPHTHALMOLOGY
AND OTOLARYNGOLOGY.**

Chairman: Members serve as chairman in alphabetical order monthly.
Secretary-Treasurer: Dr. Roland H. Myers, 1720 Exchange Bldg., Memphis, Tenn.
Assistant Secretary-Treasurer: Dr. William F. Murrah, Jr., Exchange Bldg., Memphis, Tenn.
Meeting: Second Tuesday in each month at 8:00 P.M. at Memphis Eye, Nose and Throat Hospital.

MEXICAN ASSOCIATION OF PLASTIC SURGEONS.

President: Dr. Cesar LaBoide, Mexico, D. F.
Vice-President: Dr. M. Gonzales Ulloa, Mexico, D. F.
Secretary: Dr. Juan De Dios Peza, Mexico, D. F.

MEXICAN SOCIETY OF OTOLARYNGOLOGY.

President: Dr. Rafael Giorgana.
Secretary: Dr. Carlos Valenzuela, Petrarca 332-1, Mexico 5, D. F.

MISSISSIPPI VALLEY MEDICAL SOCIETY.

President: Dr. Arthur S. Bristow, Princeton, Mo.
Secretary-Treasurer: Dr. Harold Swanberg, Quincy, Ill.
Assistant Secretary-Treasurer: Dr. Jacob E. Reisch, Springfield, Ill.

**NETHERLANDS SOCIETY OF OTO-RHINO-LARYNGOLOGY.
(Nederlandsche Keel-Neus-Oorheelkundige Vereniging.)**

President: Dr. H. Navis, Sonsbeekweg 6, Arnhem.
Secretary: Dr. W. H. Struben, J. J. Viottastraat 1, Amsterdam.
Treasurer: Mrs. F. Velleman-Pinto, Jac. Ohrechtstr. 66, Amsterdam.

NORTH CAROLINA EYE, EAR, NOSE AND THROAT SOCIETY.

President: Dr. J. C. Peele, Kinston Clinic, Kinston, N. C.
Vice-President: Dr. George E. Bradord, Winston-Salem, N. C.
Secretary-Treasurer: Dr. J. D. Stratton, 1012 Kings Drive, Charlotte 7, N. C.
Meeting:

NORTH OF ENGLAND OTOLARYNGOLOGICAL SOCIETY.

President: Mr. G. L. Thompson, 16 Ramshill Road, Scarborough, Yorkshire.
Vice-President: Mr. J. H. Otty, Frizley Old Hall, Frizinghall Road, Bradford, Yorkshire.
Secretary and Treasurer: Mr. R. Thomas, 27 High Petergate, York, Yorkshire.

**OREGON ACADEMY OF OPHTHALMOLOGY AND
OTOLARYNGOLOGY.**

President: Dr. George C. Saunders, 644 Medical Arts Bldg., Portland 5, Ore.
Secretary-Treasurer: Dr. Donald C. Mettler, 1216 S. W. Yamhill St., Portland 5, Ore.
Meeting: Fourth Tuesday of each month from September through May, Aero Club, Portland, Ore.

OTOSCLEROSIS STUDY GROUP.

President: Dr. E. H. Campbell, 133 So. 36th St., Philadelphia 4, Pa.
Secretary-Treasurer: Dr. Raymond Jordan, 121 University Place, Pittsburgh, Pa.
Meeting: Palmer House, Chicago, Ill., October, 1961.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY.

President: Dr. John F. Tolan, 1118 - 9th Ave., Seattle 5, Wash.
Secretary-Treasurer: Dr. Homer E. Smith, 686 Twelfth Ave., Salt Lake City, Utah.
Meeting:

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